JVC

Service Manual

REVISED EDITION

VIDEO CASSETTE RECORDER

MODEL HR-6700U

US JVC CORP.
Subsidiary of Victor Company of Japan, Limited.

No. 8150-B

JVC Service Manual

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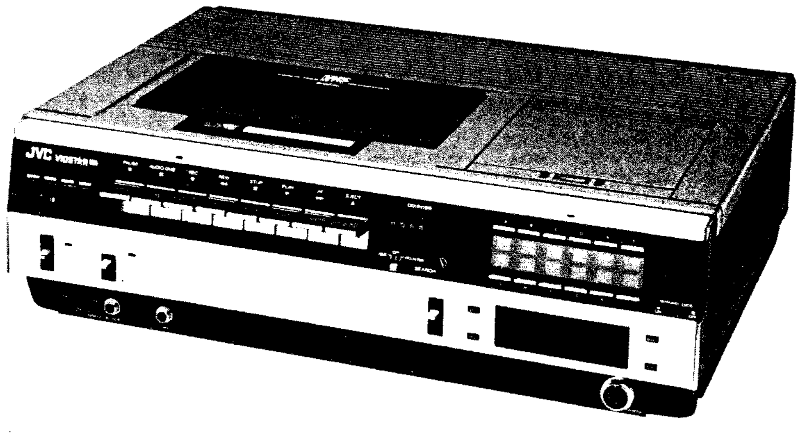

MODEL HR-6700U

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Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.

2. Parts identified by the ⚠ symbol and shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.
   Note: **Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.**

3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads

4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors

5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

7. Check that replaced wires do not contact sharp edged or pointed parts.

8. When a power cord has been replaced, check that 10–15 kg of force in any direction will not loosen it.

9. Also check areas surrounding repaired locations.

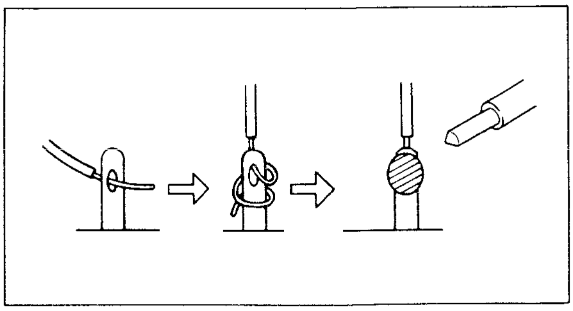


Fig. 1

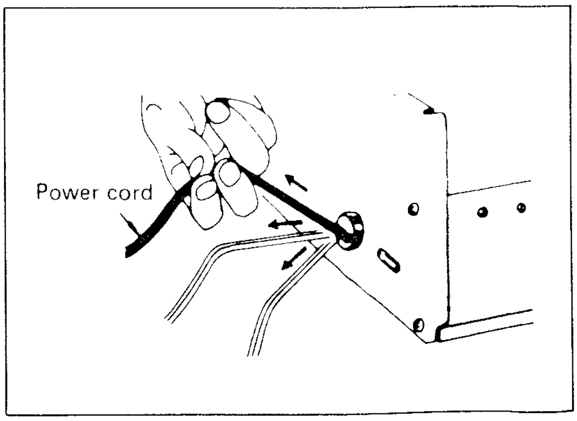


Fig. 2

10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the parts specified. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.

11. Crimp type wire connector

In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.

1. Connector part number : E03830-001
2. Required tool : Connector crimping tool of the proper type which will not damage insulated parts.
3. Replacement procedure
    1) Remove the old connector by cutting the wires at a point close to the connector.
       Important : Do not reuse a connector (discard it).
    2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.
    3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.
    4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.
    5) Check the four points noted in Fig. 7.

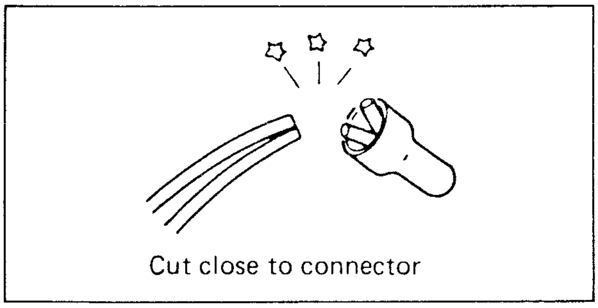

Cut close to connector

Fig. 3

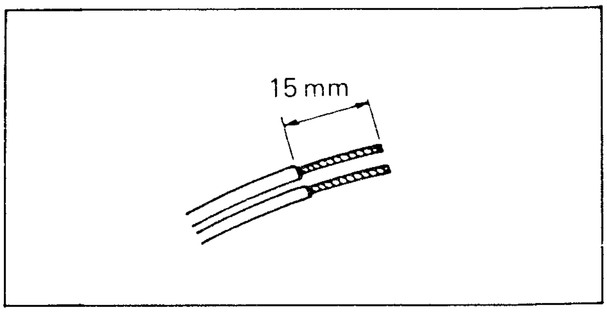


Fig. 4

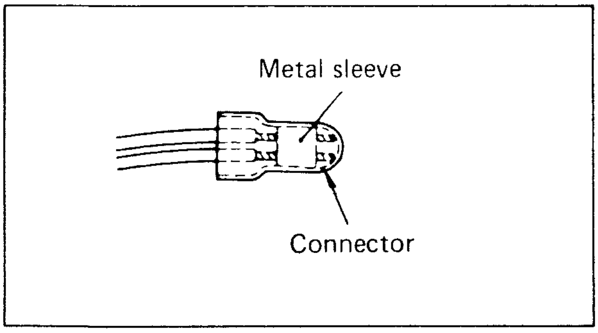

Metal sleeve
Connector

Fig. 5

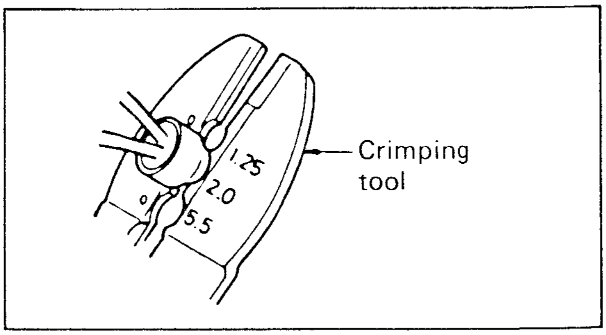

1.25
2.0
5.5
Crimping tool

Fig. 6

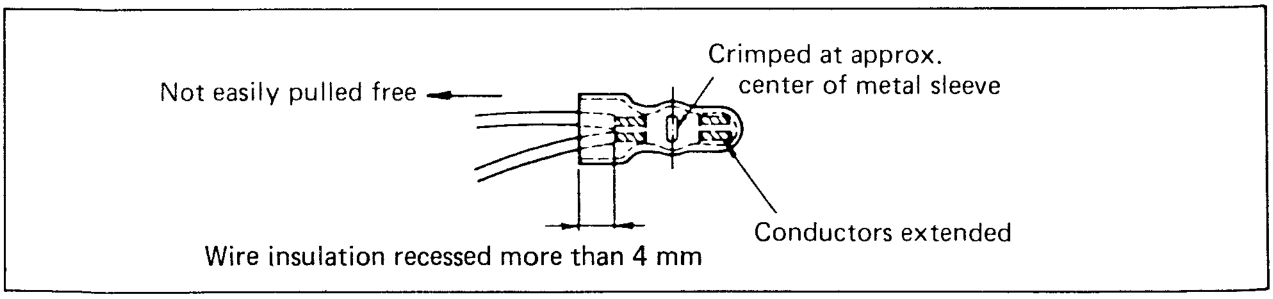

Not easily pulled free
Crimped at approx. center of metal sleeve
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

● Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions. Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. **Insulation resistance test**

   Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

2. **Dielectric strength test**

   Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.) See table below.

3. **Clearance distance**

   When replacing primary circuit components, confirm specified clearance distance (d),(d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

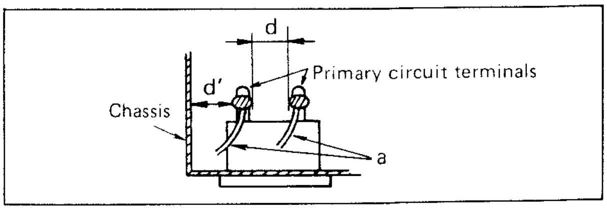


Fig. 8

Table 1: Ratings for selected areas

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance(d),(d')
100 V	Japan	$\geqq$ 1 MΩ/500 V DC	1 kV 1 minute	$\geqq$ 3 mm
110 to 130 V	USA & Canada	– – –	900 V 1 minute	$\geqq$ 3.2 mm
* 110 to 130 V 200 to 240 V	Europe Australia	$\geqq$ 10 MΩ/500 V DC	4 kV 1 minute	$\geqq$ 6 mm (d) $\geqq$ 8 mm (d') (a: Power cord)

* Class II model only.

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

4. **Leakage current test**

   Confirm specified or lower leakage current between B(earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

   Measuring Method: (Power ON)
   Insert load Z between B(earth ground,power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

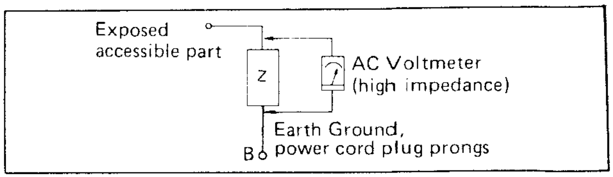
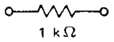
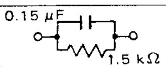
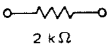
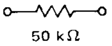

Exposed accessible part
Z
AC Voltmeter (high impedance)
Earth Ground, power cord plug prongs
B

Fig. 9

Table 2: Leakage current ratings for selected areas

AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (B) to:
100 V	Japan	 1 kΩ	i $\leqq$ 1m A rms	Exposed accessible parts
110 to 130 V	USA & Canada	 0.15 μF 1.5 kΩ	i $\leqq$ 0.5m A rms	Exposed accessible parts
110 to 130 V 200 to 240 V	Europe Australia	 2 kΩ	i $\leqq$ 0.7 m A peak i $\leqq$ 2 m A dc	Antenna earth terminals
		 50 kΩ	i $\leqq$ 0.7 m A peak i $\leqq$ 2 m A dc	Other terminals

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

SECTION 1
GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual provides service information for the JVC VHS Model HR-6700U. The manual describes the principles and adjustments of mechanical and electrical operations for this model.
Service procedures given herein cover only field maintenance services.
Adjustments which require high-level instruments, jigs and techniques are excluded, since they should be performed at the factory.
Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This video cassette recorder should be used with 120 V, 60 Hz AC only.

CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

CAUTION
To prevent electric shock, do not open the cabinet. No user serviceable parts inside. Refer servicing to qualified service personnel.

Rear panel POWER switch
The main power switch is located on the rear connector panel. Setting this switch to OFF removes all applied power from the set including the timer clock, its memory circuits and the antenna circuit. Switching the recorder section on or off is performed with the front panel FUNCTION switch having three positions: TIMER, ON and STAND BY.
Even when you are not using the HR-6700U, the rear panel POWER switch should be set to ON in order to be able to view TV broadcast programs or to keep the memory circuits in operation.

WARNING: Many of the programs broadcast by television stations are protected by copyright and Federal law imposes strict penalties for copyright infringement. Some motion picture companies have taken the position that home recording for non-commercial purposes is an infringement of their copyrights. Until the courts have ruled on the proper interpretation of the law as applied to home video recording, this equipment, if used to record copyrighted material, will have to be operated at the user's own risk.

1.2 FEATURES

- Extended six hour recording is possible using the standard T-120 cassette.
- Standard prerecorded cassettes can be played back in the standard two-hour mode with better picture and sound quality.
- A new, microcomputer-assisted timer that can perform multi-way programming for unattended recording within a week in advance utilizing six separate programs.
- VHF/UHF 12-channel pre-tunable electronic tuner with channel lock mechanism.
- Clear double-speed playback (having negligible noise) with intelligible audio from standard cassettes recorded in the two-hour mode and, in addition, triple-speed playback with cassettes recorded in the six-hour mode for time-saving viewing.
- Slow-motion playback with negligible noise (with two-hour mode recordings) at a variable speed from approx. 1/4 to 1/30 the normal.
- Still playback with negligible noise (with two-hour mode recordings) to freeze the action for more detailed viewing.
- Six-function remote control for double-speed playback (or triple-speed with six-hour recorded tapes), normal-speed playback, still-frame playback and slow-motion playback with speed control as well as pause control during recording.

- Quick-response capstan servo control enables fast stabilization of the picture and sound.
- Dual-function auto-search mechanism enables the tape to stop either at the counter reading of "9998" during rewind or at the point where a new recording was begun – during both rewind and fast-forward.
- The built-in power adapter permits direct cable hook-up of a JVC color video camera without the necessity of having an AC power adapter.
- Damped cassette door allows gentle lifting of the cassette housing.
- Convenient mode change from Play to either Fast-forward or Rewind, immediately after engaging the STOP key.
- Four-digit tape counter functioning in conjunction with the search mechanism.
- Automatic RF output selection between off-the-air broadcast and video cassette viewing.
- Automatic release mechanism which cancels the Pause, Still and Slow-motion modes after about seven minutes for tape protection.
- Automatic switching between two-hour and six-hour mode tapes for playback.
- The ESC (Edit Start Control) system minimizes picture distortion between separately recorded sections when the tape start and stop are controlled by the Pause function.

1.3 SPECIFICATIONS

Format	: VHS standard
Recording system	: Rotary, slant azimuth two-head helical scan system with two pairs of video heads, each pair exclusively either for the SP or the EP mode
Video signal system	: NTSC-type color signal
Tape width	: 12.7 mm (1/2 inch)
Tape speed	
SP	: 33.35 mm/s (1.31 inch/s)
EP	: 11.12 mm/s (0.43 inch/s)
Maximum recording time	
SP	: 120 min with JVC T-120 video cassette
EP	: 360 min with JVC T-120 video cassette
Temperature	
Operating	: 5°C to 40°C (41°F to 104°F)
Storage	: –20°C to 60°C (–4°F to 140°F)
Antenna	: VHF 75 ohms, unbalanced UHF 200 ohms, balanced
Channel coverage	: VHF channels 2–13 UHF channels 14–83
VHF output signal	: Channel 3 or Channel 4 (switchable; set to channel 3 when shipped) 75 ohms, unbalanced
Power requirement	: 120 V AC, 60 Hz
Power consumption	: 55 watts

Video

Input	: 0.5 to 2.0 Vp-p, 75 ohms unbalanced
Output	: 1.0 Vp-p, 75 ohms unbalanced
Signal-to-noise ratio	: More than 45 dB (Rohde & Schwarz noise meter)
Horizontal resolution	: More than 240 lines

Audio

Input	: Mic: –67 dBs 10 k-ohms unbalanced Line: –20 dBs 50 k-ohms unbalanced
Output level	: –6 dBs, high impedance load
Output impedance	: 1 k-ohm, unbalanced
Signal-to-noise ratio	: More than 40 dB
Frequency response	: 50 Hz to 10 000 Hz
Timer	: Weekly programmable timer (6 programs)
Dimensions	: 47.0 cm (W) x 14.7 cm (H) x 33.6 cm (D) (18-1/2" x 5-13/16" x 13-3/4")
Weight	: 14.2 kg (31 lbs)

Accessories provided : Remote control unit (PU47718G)
Video cassette tape
Dust cover (PU31773-11)
Power cord (QMP9003-015)
Channel number film (PU20826B)
Matching transformer (PU45914)

Specifications shown are for SP mode unless otherwise specified. Design and specifications subject to change without notice.

1.4 PRECAUTIONS

Handling and storage

- Avoid using the HR-6700U under the following conditions:
  - extremely hot, cold or humid places,
  - dusty places,
  - near appliances generating strong magnetic fields,
  - places subject to vibration, and
  - poorly ventilated places.

- Be careful of moisture condensation.
  Avoid using the HR-6700U immediately after moving from a cold place to a warm place or soon after heating a room which was cold, the water vapor in warm air will condense on the still-cold video head drum and tape guides and may cause damage to the tape and the recorder.

- Handle the HR-6700U carefully.
  - Do not block the ventilation openings.
  - Do not place anything heavy on the recorder.
  - Do not place anything which might spill and cause trouble on the top cover of the recorder.
  - Utilize the accessory cover to prevent dust and dirt from accumulating on the recorder when not in use.
  - Use in horizontal (flat) position only.

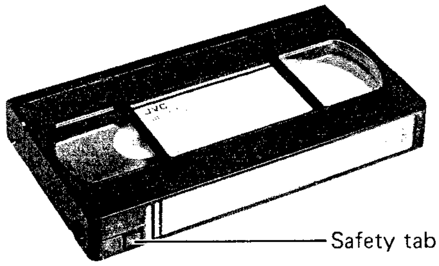


Fig. 1-1

- In case of transportation,
  - Avoid violent shocks to the recorder during packing and transportation.
  - Before packing, be sure to remove the cassette from the recorder.

Video cassettes

- The HR-6700U employs VHS type cassette only. T-120 for 120/360 minutes, T-60 for 60/180 minutes and T-30 for 30/90 minutes of recording.

- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use adhesive tape to block the hole.

- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.

- Avoid extreme humidity, violent vibrations or shocks, strong magnietic fields (near a motor, transformer or a magnet) and dusty places.

- Place the cassettes in cassette cases and position vertically.

Moisture condensation

- If you pour a cold liguid into a glass, water vapor in the air will condense on the surface of the glass. This is called moisture condensation.

- Moisture condensation on the head drum, one of the most crucial parts of the HR-6700U, will cause damage to the tape.

- Moisture in the air will condense on the HR-6700U when you move the unit from a cold place to a warm place, after heating a cold room or under extreme humidity conditions.

- Should the PLAY key return to its previous position by itself right after being depressed, the cause may be moisture condensation. If such is the case, repeat the FF and REW operations.

- The HR-6700U is equipped with a moisture condensation prevention circuit. This circuit operates only when the unit is attached to an AC outlet and the rear panel POWER switch is set to ON.

1.5 CONTROLS AND CONNECTORS

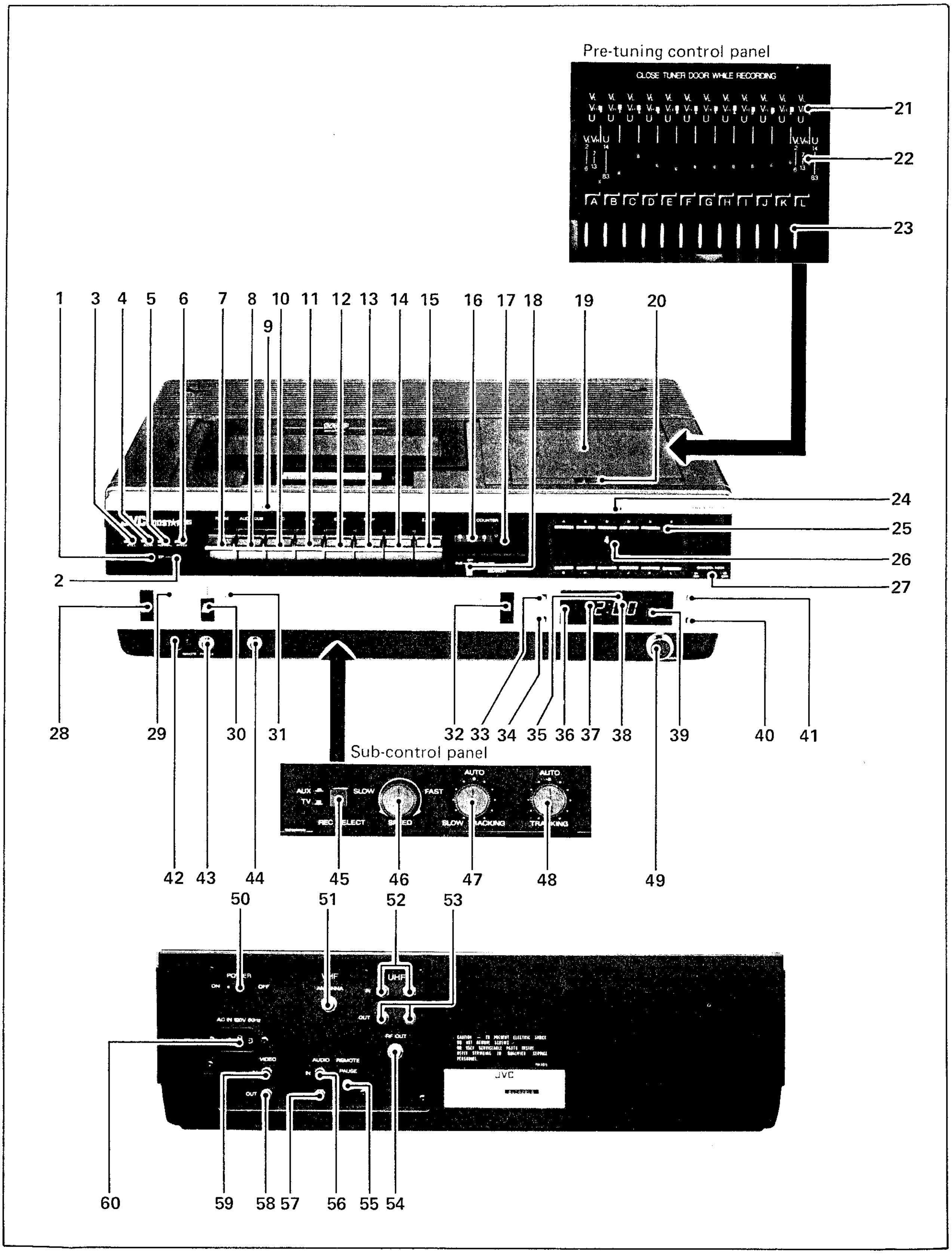

Pre-tuning control panel
CLOSE TUNER DOOR WHILE RECORDING
A B C D E F G H I J K L
21
22
23
1 3 4 5 6 7 8 10 11 12 13 14 15 16 17 18 19 20
9
COUNTER
24
25
26
27
2
28 29 30 31 32 33 34 35 36 37 38 39 40 41
Sub-control panel
AUX
TV
SLOW
FAST
AUTO
REC SELECT
SPEED
SLOW TRACKING
TRACKING
42 43 44 45 46 47 48 49
50 51 52 53
POWER
ON
OFF
VHF
ANTENNA
UHF
IN
OUT
RF OUT
AC IN 120V 60Hz
VIDEO
AUDIO
REMOTE
PAUSE
JVC
60 59 58 57 56 55 54

Fig. 1-2

1. **SP/EP recording mode select switch**
   Set to SP (Standard Play) when you wish recordings to be made in the 2-hour standard mode with better picture and sound quality. Set to EP (Extended Play) when you wish to record longer TV shows or for continuous unattended recording of TV serials. 6-hour continuous recording is available in the EP mode. If you wish to apply slowmotion or still playback with less noise, select the SP position when recording.
   This switch has no effect during palayback.
2. **EP mode indicator**
   Lights during recording and playback in the EP mode.
3. **STILL button**
   Press to view still-frame playback.
4. **SLOW button**
   Press to view slow-motion playback. The slow-motion speed can be adjusted with the SLOW SPEED control knob (46) located on the lower sub-control panel.
5. **NORMAL button**
   Press to view the tape at a normal speed either in the 2-hour of 6-hour mode. The 2-hour or 6-hour recorded tape is automatically detected for playback at its correct speed.
6. **SPEED button**
   Press to view the tape at a speed twice the normal (for 2-hour mode recordings) or at a speed three times the normal (for 6-hour mode recordings)
7. **PAUSE key**
   Depress to stop the tape temporarily to avoid recording of unwanted parts of the program.
8. **AUDIO DUB key**
   Depress together with the PLAY key to record auido on a pre-recorded tape.
9. **Recording indicator**
   Lights when the REC or AUDIO DUB key is depressed.
10. **REC key**
    Depress together with the PLAY key for video and audio recording.
11. **REW key**
    Depress to rewind the tape. The REW key may be depressed immediately after depressing the STOP key.
12. **STOP key**
    Depress to stop the tape.
13. **PLAY key**
    Depress to play back the tape. Depress together with the REC key for recording or with the AUDIO DUB key for audio dubbing.
14. **FF key**
    Depress to fast forward the tape. The FF key may be depressed immediately after depressing the STOP key.
15. **EJECT key**
    Depress to open the cassette holder.
    The cassette housing will gently lift.
16. **Tape counter**
17. **Counter reset button**
    Depress to reset the counter to "0000".
18. **SEARCH switch**
    Two search modes are available; COUNTER search and CUE search.
    COUNTER: When the switch is set to COUNTER, the tape stops automatically at the counter reading of "9998" during rewind.
    CUE: When the switch is set to CUE, the tape stope automatically at a point where a new recording was made during either rewind or fast-forward by sensing the cue signal.
    OFF: Set the switch to this position for ordinary rewinding.
19. **Pre-tuning control compartment cover**
    Opening the cover makes accessible the built-in electronic tuner pre-tuning controls.
20. **Compartment cover release tab**
    Slide the tab in the direction of the arrow to open the cover. Closing the cover activates the automatic fine-tuning circuit.
21. **VHF/UHF band selectors**
    A three-position switch for selecting the VHF low channels (channel 2 to 6), VHF high channels (channel 7 to 13) and UHF channels (channel 14 to 83) is provided for 12 separate channels.
22. **Pre-tuning indicators**
    Indicate the channel to which each channel selector is tuned.
23. **Pre-tuning controls**
    Turn in either direction to tune in each of the 12 different television stations. (Set for channels active in your area.)
24. **Channel setting indicator**
    A red lamp flickers when the built-in microcomputer is ready to memorize a channel preset for timer recording.
25. **Channel selector buttons**
    Press to select the specific channel from which you want to record.
26. **Channel indicator**
    The numeral corresponding to the selected channel is illuminated.
27. **CHANNEL LOCK switch**
    Press to On after you select the channel. Then accidentally touching any other channel selector button will not change the selected channel. Release to OFF when you select a new channel.

28. **FUNCTION switch**
Set to ON when you use the recorder for recording or playback. Set to TIMER after you have preset the recorder for unattended timer recording, and the power will switch on automatically when the preset time is reached.
Set to STAND BY when you switch off the power from the recorder section.
When this switch is set to ON, the recorder's built in tuner operates to receive off-the-air TV programs, while the TV receiver's built-in tuner operates to receive off-the-air TV programs when the switch is set to STAND BY. Therefore, in the former case, by setting the TV receiver channel selector to your video channel you can see pictures on the TV screen that are chosen with the recorder's channel selectors and, in the latter case, you can select any channel with the TV receiver's channel selector for regular TV viewing.

29. **FUNCTION indicator**
A red lamp lights while the recorder section is being powered.

30. **VIDEO/TV switch**
Selection between video and TV viewing is automatic. When the FUNCTION switch is set to ON, the switch is automatically set to the VIDEO position and the red VIDEO indicator lights. When the FUNCTION switch is set to the STAND BY position, the connected TV receiver is automatically made ready to receive off-the-air programs. Press this switch down only when you are viewing one TV program while recording another simultaneously This switch does not lock, but the TV position setting is made known by the extinguishing of the VIDEO indicator. This switch has no effect during playback of cassettes.

31. **VIDEO indicator**
Indicates that the recorded program being played back or off-the-air programs being received by the built-in tuner can be viewed on the connected TV.

32. **Display function select switch**

PROGRAM SET:	Set to this position when you program the timer by entering such data as the day of the week, switch-on time, recording length and the channel from which you want to record.
CLOCK:	Leave the switch in this position after you have preset the timer and have set the clock to the correct local time, and the digital display shows the present day and local time.
CLOCK SET:	Set to this position when you adjust the clock for the day of the week and the local time.

33. **CANCEL button**
Press this button to cancel or "clear" the preset data after calling up the corresponding program number on the display.

34. **PROGRAM button**
Press to call up a program memory on which the recording data are to be entered. Recording data can be entered for each of 6 different programs. Programs 1 through 3 are for single recordings and the data memorized on these programs are cleared automatically after the recorder has completed a cycle of the preset operation. Programs 4 through 6 are maintained permanently for serial recordings until you press the CANCEL button.

35. **Day indicator**
Both for constant day indication and day presetting for future recordings. Each one successively, or all of the days, flash when the microcomputer is ready to accept an entry for setting.

36. **PROGRAM NO. indicator**
Numerals 1 through 6 are successively displayed to show which program's preset data is ready to be checked or altered.

37. **Hour digits**
When these two digits flash, you can set the hour indication for either clock time setting or preset time setting.

38. **Minute digits**
When these two digits flash, you can set the minute indication for either clock time setting or preset time setting.

39. **SEC/REC LENGTH digits**
When the display function select switch is set to CLOCK or CLOCK SET, a two-digit figure appears to count the seconds. When the display function select switch is set to PROGRAM SET, three digits appear and a recording length can be set in minutes (in 5-minute increments up to 395). In either mode, the flashing digits show that you are ready to enter the data.

40. **SET button**
In the Program set mode:
For setting the channel, day, time and recording length. Holding it pressed continuously advances the indication rapidly.
In the Clock set mode:
For setting the second, minute, hour and day. If held pressed, advances the indication rapidly except for the second indication which holds at "00" for to-the-second clock setting.

41. **SELECT button**
Press to select the item for setting.
In the Program set mode, the item for setting is switched every time this button is pressed in the order of Channel – Day – Hour – Minute – Recording length, repeatedly, and the corresponding portion of the display flashes.
In the Clock set mode, the item for setting is switched every time this button is pressed in the order of Second – Minute – Hour – Day, repeatedly, and the corresponding portion of the display flashes.

42. **REMOTE terminal**
Connect the remote control unit (provided) to this terminal.

43. **PHONES jack**
Connect headphones to this terminal for monitoring the sound during audio dubbing or for private listening.

44. **MIC jack**
Connect a microphone for audio dubbing or mixed recording.

45. **REC SELECT switch**
Press to AUX when you are recording with a video camera or from other video sources.
Leave it in its TV position ("out" position) for taping off-the-air programs.

46. **SLOW SPEED control knob**
During slow-motion playback, turn this knob to obtain your desired speed (from approx. 1/4 to 1/30 the normal speed); toward FAST for faster and SLOW for slower speeds.

47. **SLOW TRACKING control knob**
Turn to minimize noise bar, if observed during slow-motion playback.

48. **TRACKING control knob**
Turn to minimize noise bar, if observed during normal-speed or double-speed playback.

49. **CAMERA connector**
Connect a JVC camera directly to this connector using a 10-pin camera cable.

> **Caution:**
> Other brands of cameras and some JVC cameras may not be electronically compatible, even though the same type of connector is used.

50. **POWER switch**
Switching ON applies power to the set. To switch off the set completely, set the POWER switch to OFF. This switches off the timer clock and cancels all the preset programming data. This also switches off the built-in antenna circuit so that the connected TV receiver cannot receive off-the-air TV programs. Normally set this POWER switch to ON.

51. **VHF ANTENNA connector**
Connect the 75-ohm VHF antenna coaxial cable to this connector.

52. **UHF IN antenna terminals**
Connect the feeder from the UHF antenna to these terminals.

53. **UHF OUT antenna terminals**
Connect to the UHF antenna terminals of a TV receiver through an optional UHF antenna cable.

54. **RF OUT connector**
Connect to the VHF antenna connector of a TV receiver through the VHF antenna cable provided.

55. **REMOTE PAUSE terminal**
The optional Pause remote control switch (RM-42) can be connected here to control only the pause function from a distance.

56. **AUDIO IN terminal**
Connect to a tape recorder or other audio sources.

57. **AUDIO OUT terminal**
Audio signals being recorded or played back are available from this terminal.

58. **VIDEO OUT terminal**
Video signals being recorded or played back are available from this terminal.

59. **VIDEO IN terminal**
Connect a video camera or other video input here.

60. **AC IN socket**
Connect the AC power cord provided to this socket.

REMOTE CONTROL UNIT

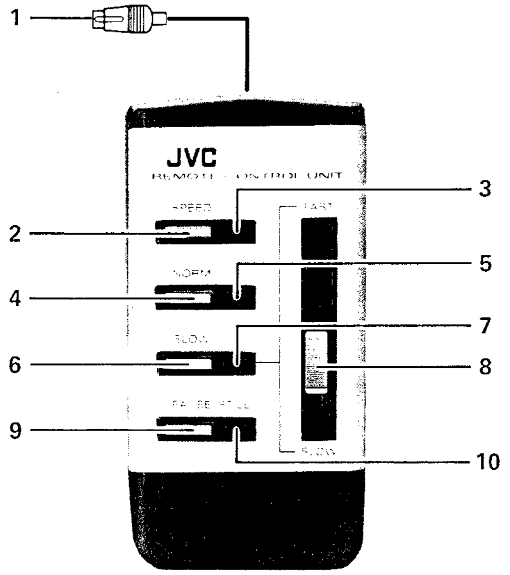

1
JVC
REMOTE CONTROL UNIT
3
SPEED
2
FAST
5
NORM
4
7
SLOW
6
8
PAUSE/STILL
9
SLOW
10

Fig. 1-3

1. **Remote control plug**
   Insert into the front REMOTE terminal (8 pin DIN connector plug).
2. **SPEED PLAY button**
   Press to accelerate the playback speed. The standard 2-hour mode recordings are played at a speed twice the normal and the recordings made in the 6-hour (EP) mode are played back at a speed three times the normal.
3. **SPEED PLAY indicator**
4. **NORMAL button**
   Press for normal-speed playback.
5. **NORMAL indicator**
6. **SLOW MOTION button**
   Press for slow-motion playback.
7. **SLOW MOTION indicator**
8. **Slow-motion speed control knob (FAST/SLOW)**
   During slow-motion playback, slide this knob to obtain your desired speed; toward FAST for faster and SLOW for slower speeds.
9. **PAUSE/STILL button**
   Press for stop-action (still-frame) playback.
   While you are recording, press this button to stop the tape in order to avoid recording unwanted material.
10. **PAUSE/STILL indicator**

1.6 CONNECTION DIAGRAM

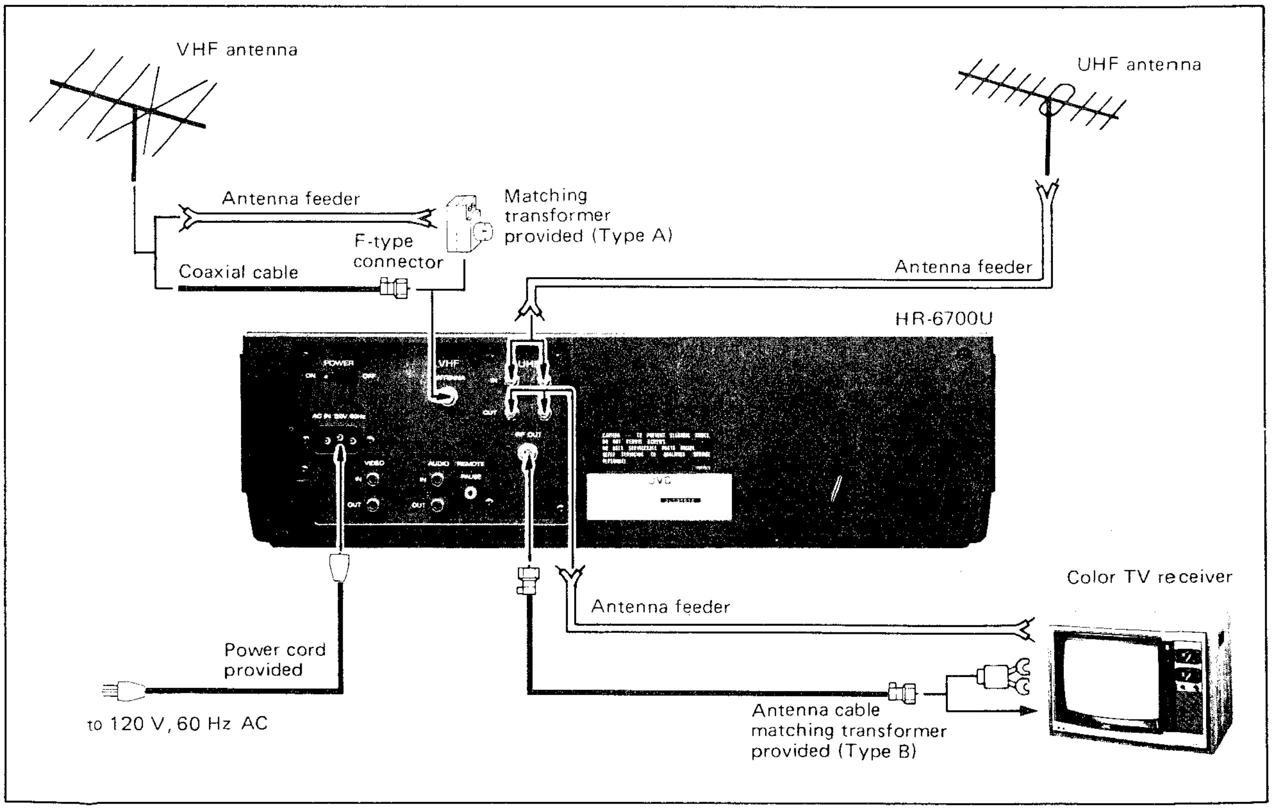

VHF antenna
UHF antenna
Antenna feeder
Matching transformer provided (Type A)
F-type connector
Coaxial cable
Antenna feeder
HR-6700U
POWER
ON
OFF
VHF
UHF
IN
OUT
AC IN 120V 60Hz
VIDEO
IN
OUT
AUDIO
IN
OUT
REMOTE
PAUSE
RF OUT
JVC
Color TV receiver
Antenna feeder
Power cord provided
to 120 V, 60 Hz AC
Antenna cable matching transformer provided (Type B)

Fig. 1-4

NOTES:

- *Remove the VHF and UHF antenna cables from the TV receiver and reconnect to the HR-6700U as illustrated. The HR-6700U is then ready to record off-the-air programs.*
- *Connect the HR-6700U to the TV receiver using the VHF antenna cable (provided) and a UHF antenna cable as illustrated. The TV receiver is then ready to receive TV broadcast programs as well as play the video cassettes.*
- *Even when you are not using the HR-6700U, the rear panel POWER switch should be set to ON in order to be able to view TV broadcast programs with this connection. (See page 1-1.)*

1.7 VIDEO CHANNEL SETTING

The built-in RF converter permits playback of video and audio recordings through a TV receiver. The signals from the RF converter are viewed through a vacant channel not used for broadcasting in your viewing area.

The converter channel of all units is set to 3 prior to shipment from the plant. Reset the channel to 4 in areas where channel 3 is employed for broadcasting.

For this purpose, with POWER OFF AND UNIT UNPLUGGED, carefully insert a small screwdriver in the hole provided in the bottom of the unit and shift the switch to HIGH CH (CH-4).

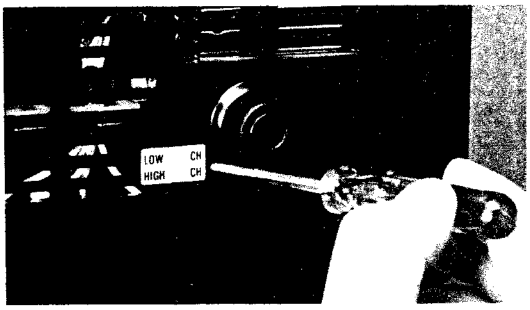


Fig. 1-5

This is YOUR video channel. To view video cassettes, always set the TV channel selector to either channel 3 or 4.

1.8 TIMER CLOCK SETTING

When the HR-6700U is plugged into an AC outlet and the rear panel POWER switch is turned ON, the display shows a flashing SUN 88:88 00. The same state appears after a power failure has occurred, lasting longer than the memory-hold capacity. When the display function select switch is set to CLOCK SET, the built-in timer clock starts time-keeping.

Setting to the correct day and time

1. Set the display function select switch to CLOCK SET.
   - The "second" digits will start counting while flashing.

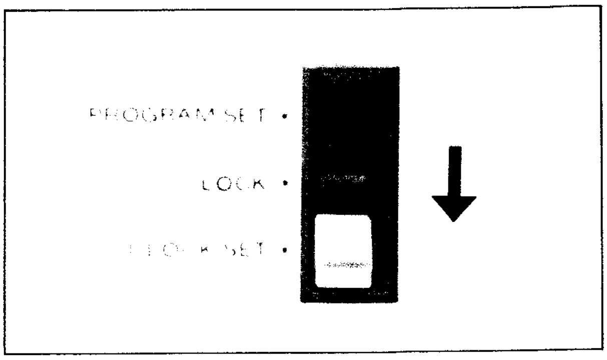


Fig. 1-6

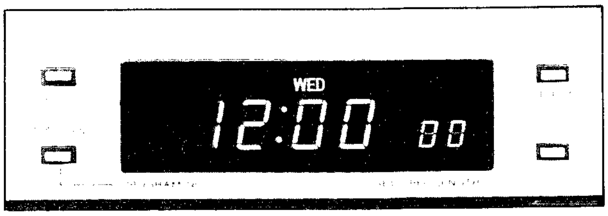


Fig. 1-7

2. Press the SELECT button, and then the minute digits will start flashing.
3. Press the SET button until the correct minute indication is displayed.
   - It is recommended that you obtain a minute indication one minute ahead of the correct local time for the purpose of later making a to-the-second setting.
4. Press the SELECT button, and then the hour digits will start flashing.
5. Press the SET button until the correct hour indication is displayed.
6. Press the SELECT button, and then the SUN will start flashing.
7. Press the SET button until the correct day is displayed.
8. Press the SELECT button, and then the second digits will start flashing.
9. Hold the SET button pressed, and the seconds will be reset to and held at "00".

10. Release the button at the exact instant of the time signal, and the timer clock will be set accurately to the present time.
11. Return the display function select switch to CLOCK.

- Your Vidstar uses the international 24-hour time system. For PM hours add 12 hours; for AM hours, no addition is necessary.
- Holding the SET button pressed for more than 1 second continuously advances the day, hour or minute indication automatically. Pressing it once advances the indication in single increments only.
- To re-adjust the clock (for a slight increase or reduction), set the display function select switch to CLOCK SET and press the SET button. The seconds from 0 to 29 seconds will be reset to "00" and that from 30 to 59 seconds will be reset to "(+1):00".

1.9 BUILT-IN TUNER PRE-TUNING

The 12 tuning controls have been set to VHF channels 2—13 prior to shipment to correspond with the 12 front panel channel selectors from the upper left to the lower right. If you want to change these presettings, to alter the channel sequence or to receive UHF channels, proceed as follows:

1. Turn the power switches to ON on the TV receiver and the HR-6700U.
2. Set the TV receiver channel to the output channel of the RF converter built within the recorder (your VIDEO CHANNEL).
3. Make sure that the VIDEO indicator is lit, and that the REC SELECT switch on the sub-control panel is in the TV position.

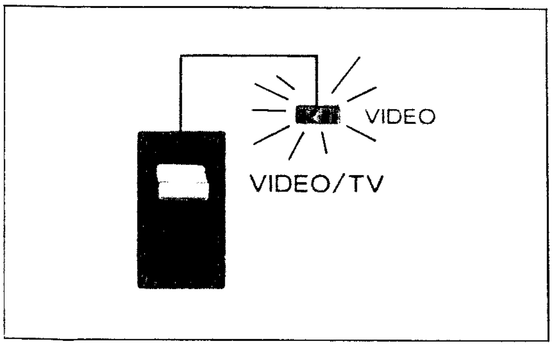


Fig. 1-8

4. The recorder will start operating and a TV program being received by the built-in tuner will be shown on the TV receiver.
5. Make sure that the CHANNEL LOCK switch is in the OFF position.

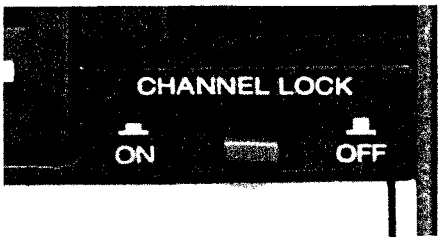


Fig. 1-9

6. Open the pre-tuning control compartment cover.

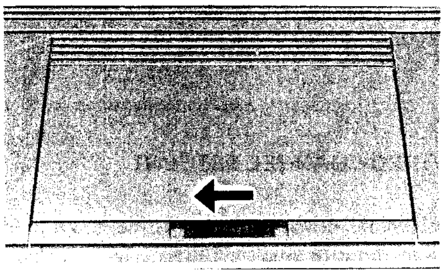


Fig. 1-10 (a)

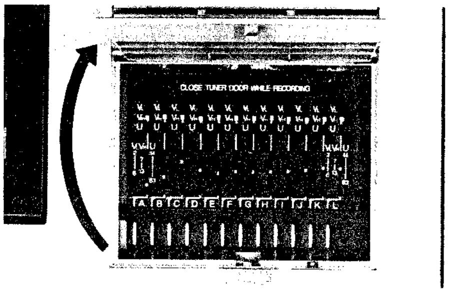


Fig. 1-10 (b)

7. Press the channel selector which you've chosen to allocate for the station to be pre-tuned in. The channel number corresponding to the selected channel will be illuminated.

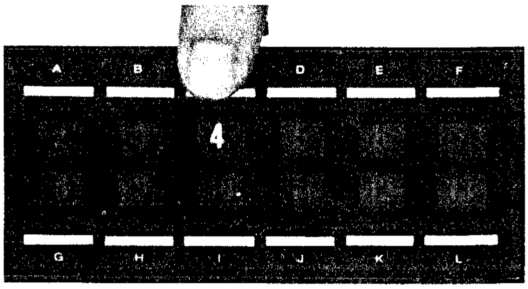


Fig. 1-11

8. The channel selectors and the tuning controls are labelled with alphabetical letters to facilitate identifying corresponding pairs. To make tuning for the A channel selector, turn the A tuning control. The same applies to B, C, D, . . .

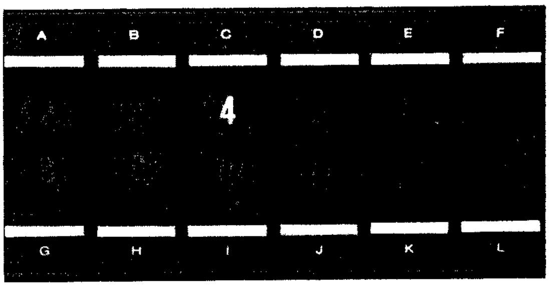

A
B
C
D
E
F
4
G
H
I
J
K
L

Fig. 1-12 (a)

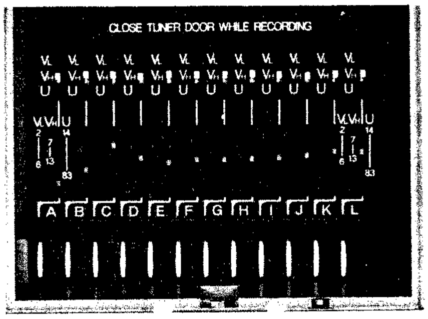
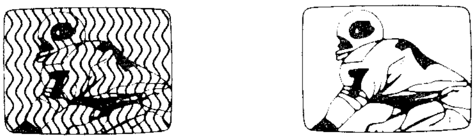

CLOSE TUNER DOOR WHILE RECORDING
A
B
C
D
E
F
G
H
I
J
K
L

Fig. 1-12 (b)

9. Set the VHF/UHF band selector as required.
   Set to VL when tuning in to VHF channels 2 through 6.
   Set to VH when tuning in to VHF channels 7 through 13.
   Set to U when tuning in to UHF channels 14 through 83.
10. Tune in to a desired station by turning the corresponding tuning control while observing the TV screen.
    - Turning the tuning control in either direction moves the pre-tuning indicator in that same direction.
11. To obtain the best possible picture, make further adjustments.



Striped picture   Clear picture

Fig. 1-13

- Turn the tuning control first until you get the striped picture, and then slowly turn, little by little, to clear up the picture.

12. Perform the same adjustments, steps 7 through 11, for each of the other channels.

1.10 REPLACING THE CHANNEL NUMBERS

Prior to shipment, the channels on the channel indicator panel are numbered 2 through 13 from the upper left to the lower right. If you have changed the preset channels, replace the channel numbers in the following manner:

1. Remove the channel indicator panel retainer by sliding outwards.

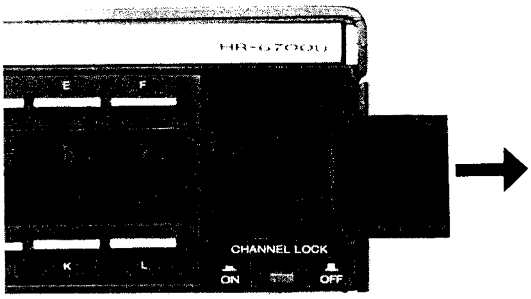
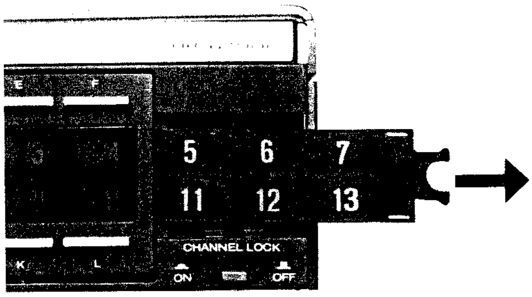

HR-6700U
E
F
K
L
CHANNEL LOCK
ON
OFF

Fig. 1-14

2. Pull out the channel number film holder and remove the no-longer-appropriate number film.


E
F
5
6
7
11
12
13
CHANNEL LOCK
K
L
ON
OFF

Channel number holder

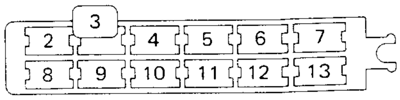

3
2
4
5
6
7
8
9
10
11
12
13

Fig. 1-15

3. Separate the appropriate number film from the provided channel indicator film sheet by twisting it. Insert it into the channel number holder.

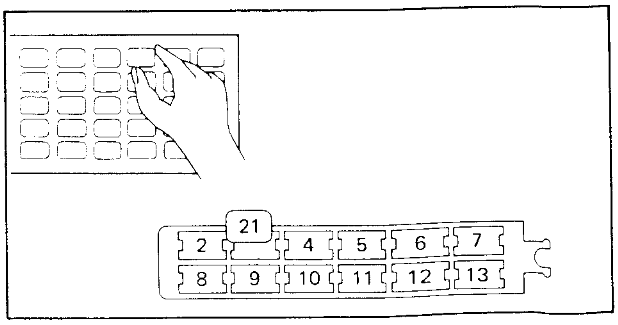

21
2
4
5
6
7
8
9
10
11
12
13

Fig. 1-16

4. Insert the channel number holder so that the numbers are clearly seen.

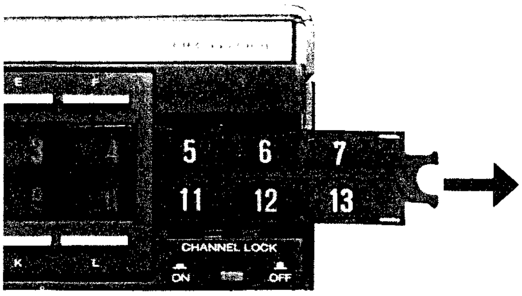


Fig. 1-17

5. Replace the channel indicator panel retainer.

1.11 LOADING AND UNLOADING THE VIDEO CASSETTE

Loading

1. Depress the EJECT key. The cassette holder will rise gently.

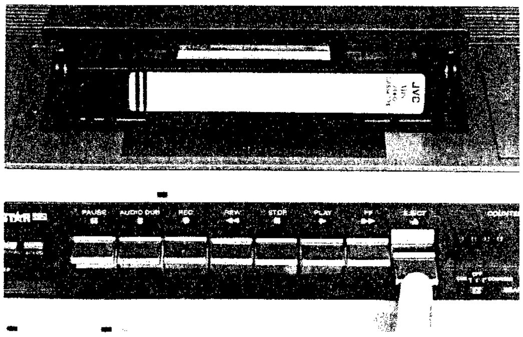


Fig. 1-18

2. Load the cassette in the proper manner as shown.

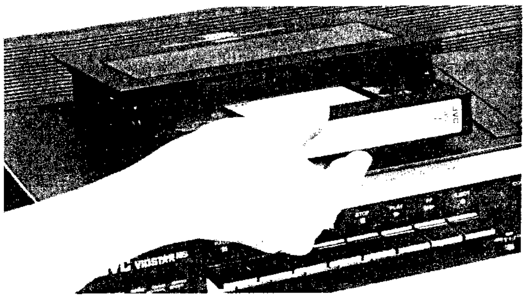


Fig. 1-19

3. Press the holder down to lock in the cassette.

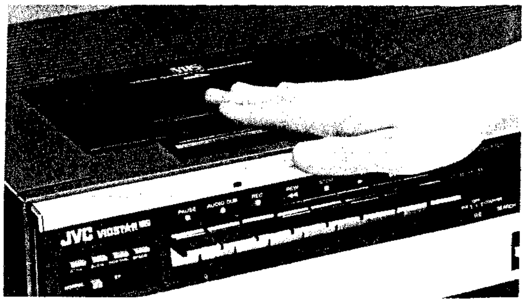


Fig. 1-20

NOTES:

- *A cassette inverted cannot be inserted.*
- *Be sure the cassette is fully inserted into the holder before pressing down.*

Unloading

1. Depress the EJECT key after making sure that the HR-6700U is in the Stop mode. The cassette holder will rise gently.
2. Remove the cassette.
3. Press down on the holder.

NOTE:

- *First make sure that the HR-6700U is not in operation. If in operation, depress the STOP key.*

1.12 RECORDING TV PROGRAMS

NOTE: See copyright warning on page 1-1.

Preparation

1. Load a cassette.
2. Set the REC SELECT switch to TV.
   - To open the sub-control panel cover, pull the tabs (located on either side of the cover) with both hands in order to release the cover evenly.

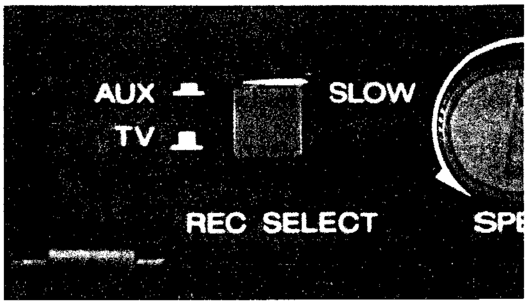


Fig. 1-21

3. Make sure that the VIDEO indicator is lit.
4. Set the SP/EP switch to either SP or EP depending on the recording mode you have chosen (2-hour or 6-hour mode).
   - The EP mode indicator will light when the EP position is selected.

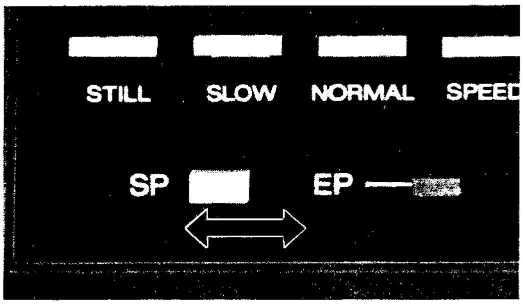


Fig. 1-22

5. Set the TV receiver to your video channel (3 or 4).
6. Press the recorder's channel selector corresponding to the channel you wish to record.

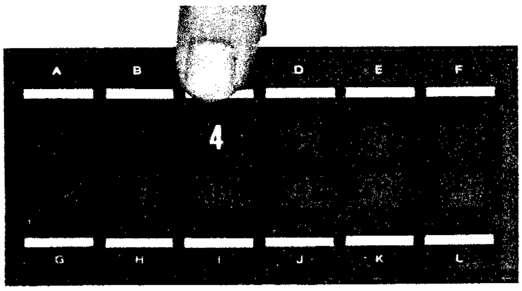


Fig. 1-23

7. The pictures you are going to record will appear on the TV screen, but recording is not yet taking place.

NOTES:

- *It is recommended that you set the CHANNEL LOCK switch to ON.*
- *Some noise appears on the TV screen if you play back a cassette recorded in the EP mode in the slow-motion, still or speed-play mode. It is recommended that you select the SP mode if you wish to obtain playback pictures having less noise when operating in these modes.*

Recording picture adjustment

Closing the pre-tuning control compartment cover switches on the built-in AFT (Automatic Fine Tuning) circuit. Clear pictures are normally obtained when the cover is firmly closed. However, if a clear picture or correct color is not obtained, re-perform tuning in the manner described in "BUILT-IN TELEVISION TUNER PRE-TUNING".

NOTES:

- *If the picture is still not clear, perform the fine tuning adjustment on the TV receiver.*
- *Distorted pictures or sound will be recorded if fine tuning has not been properly performed. Exercise care with this adjustment since the recorded picture and sound cannot be adjusted later.*

Recording operation

1. Depress the REC and PLAY keys simultaneously. Recording will start.
   - If the REC key cannot be depressed, check to see if the cassette safety tab has been removed.
   - Make sure that the NORMAL button is pressed.
   - If the remote control unit is connected, make sure that its NORMAL button is pressed.

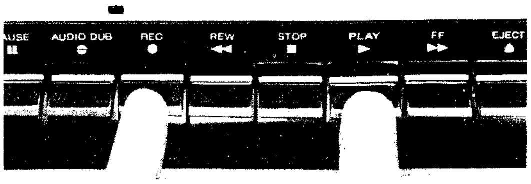


Fig. 1-24

2. To skip recording part of the program, depress the PAUSE key, or press the PAUSE/STILL button on the remote control unit, if connected. The tape will stop while in the Record mode. To restart recording, depress the PAUSE key again, or press the NORMAL button on the remote control unit, if connected. If the RM-42 remote control switch is connected to the rear panel terminal, it can perform the same operation.

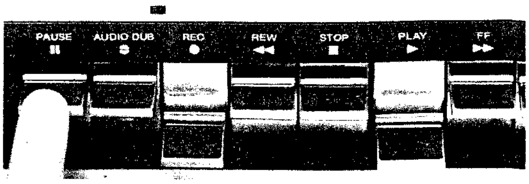


Fig. 1-25

3. To stop recording, depress the STOP key.

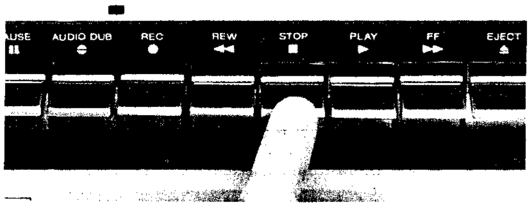


Fig. 1-26

NOTE:

- *Sound from a microphone connected to the MIC jack can be mixed with the TV sound being recorded.*

1.13 PLAYBACK

Normal playback

1. Load a cassette.

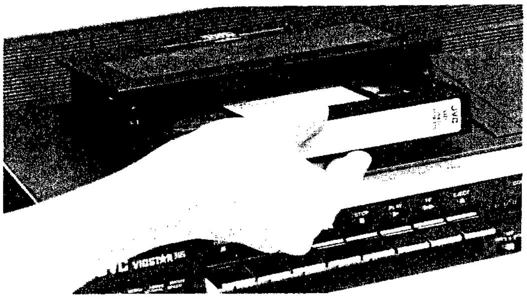


Fig. 1-27

2. Set the TV channel selector to your video channel (3 or 4).
3. Depress the REW key to rewind the tape, if necessary.
4. Depress the PLAY key to start playback.

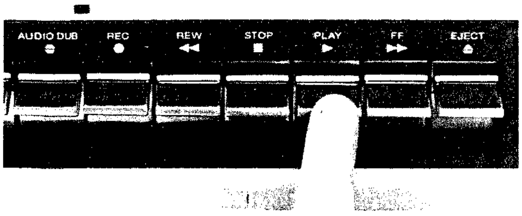


Fig. 1-28

- Make sure that the NORMAL button, either on the recorder or the remote control unit, if connected, has been pressed.
- The SP/EP switch may be in either position. The 2-hour or 6-hour mode recording is automatically detected and played back at a correct speed respectively.
- Although the SP/EP switch has no functional effect during playback, the EP mode indicator also shows the mode of the tape being played back. Upon playback of EP tapes, the EP mode indicator remains lit if the SP/EP switch has been set at EP, but lights automatically if the switch has been set at SP. Upon playback of SP tapes, this indicator remains extinguished if the SP/EP switch has been set at SP, and extinguishes automatically if set at EP.

5. Depress the STOP key to stop playback.

- If you wish to rewind or fast-forward the tape after stopping the tape, you can depress the REW or FF key immediately after depressing the STOP key. The rewind or fast-forward instruction is memorized and, after the tape has come to a stop, it starts rewinding or fast-forwarding automatically.

Variable speed playback

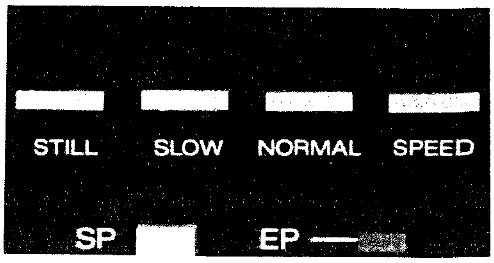


Fig. 1-29

The playback speed can be varied with the four buttons in the upper left corner of the front panel; still-frame, slow-motion, normal-speed and double-speed (for cassettes recorded in the 2-hour SP mode) or triple-speed (for cassettes recorded in the 6-hour EP mode) playback.

NOTES:

- *When you depress the PLAY key, the tape is loaded and playback starts in the mode selected with these buttons.*
- *The playback mode can be changed at any time by pressing the corresponding button.*
- *The slow-motion playback speed can be varied by turning the SLOW SPEED FAST/SLOW knob on the sub-control panel.*

- *During double-speed playback (when the SPEED button is pressed during playback of a standard 2-hour cassette), the sound is also accelerated, but maintains intelligibility.*
- *During triple-speed playback (when the SPEED button is pressed during playback of a cassette recorded in the 6-hour EP mode), there is no audio, however, this function serves as a convenience for quickly running through longer tape sections until you've reached the actual section you want to view.*
- *No audio can be heard in the still-frame and slow-motion modes.*
- *When the STILL button is depressed, noise bar may appear. Depress the SLOW button and adjust the SLOW TRACKING control knob until noise bar is minimized, then switch back to still.*
- *During variable-speed playback of cassettes recorded in the EP mode, more noise appears on the TV screen compared with those recorded in the SP mode. This is not due to any defect of the unit.*

How to use the remote control unit

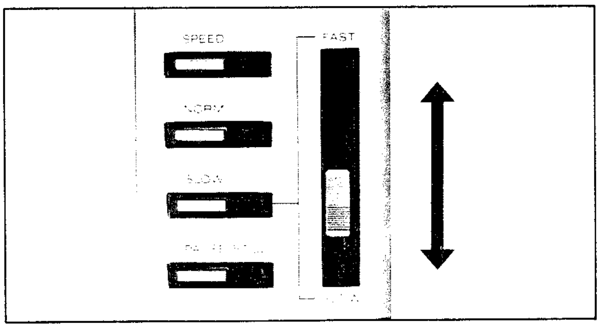


Fig. 1-30

All the controls for variable-speed playback are duplicated on the remote control unit so that you can control the playback speed from a distance. The remote control unit has priority over the recorder's controls, therefore, the recorder's controls for variable-speed playback have no effect when the remote control unit is connected. The Pause function can be also controlled with the recorder's PAUSE key even when the remote control unit is connected.

- The slow-motion playback speed can be controlled with the sliding knob. After pressing the SLOW button, slide this knob toward either FAST or SLOW.
- Do not press two or more buttons simultaneously, as this could cause malfunctioning of the remote control unit.

NOTES:

- *The Still, Pause and Slow-motion modes are automatically released after about 7 minutes in order to prevent tape damage.*
- *Noise bars may appear on the screen if you play back a tape which was recorded using another recorder. In such cases, adjust the corresponding TRACKING control depending on the playback mode; TRACKING control during normal- and speed-playback and SLOW TRACKING control during slow-motion playback. Turn the knob in either direction to adjust the picture. After playing a particular tape, return the knob to the AUTO position.*
- *Noise bars appearing during slow-motion, speed-play or still playback of cassettes recorded in the EP mode cannot be reduced by adjustment of the TRACKING controls.*

How to use the SEARCH switch

- **Counter search function**

The SEARCH switch can be employed to automatically index the tape in conjunction with the tape counter.

1. At the start of recording or playback, depress the counter reset button to reset the counter to "0000"

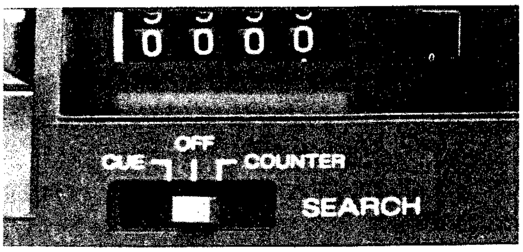


Fig. 1-31

2. Set the SEARCH switch to COUNTER.

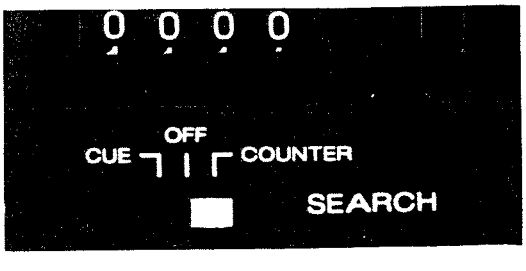


Fig. 1-32

3. If you rewind the tape in this state, the tape automatically stops when the counter reaches "9998". Therefore, the beginning of the recording or the section you want to play back again can be located easily.

- **Cue search function**

At the beginning of every recording, a cue signal is recorded on the tape. The cue search function enables the sensing of this cue signal and stops the tape at a point where a new recording was made.

1. Set the SEARCH switch to CUE before rewinding or fast-forwarding the tape.

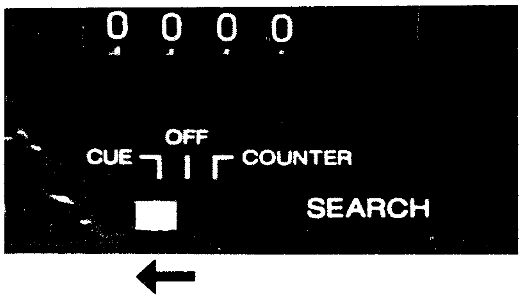


Fig. 1-33

2. If you rewind or fast-forward the tape, the tape automatically stops at the position where the cue signal is recorded.
3. If you wish to further rewind or fast-forward the tape to find the next cue position, re-depress the REW or FF key.

NOTES:

- *The cue signal is recorded in the following cases:*
  - *(1) When a recording is initiated from the Stop mode: STOP – REC.*
  - *(2) When a timer recording is initiated: TIMER ON – REC.*
  - *(3) When a recording is initiated from the Playback mode by first engaging the Pause mode, then depressing the REC key and releasing the PAUSE key: PLAY – PAUSE – REC.*
- *If you wish to rewind or fast-forward the tape completely, set the SEARCH switch to OFF.*

1.14 RECORDING ONE PROGRAM WHILE WATCHING ANOTHER

A program not being viewed can be recorded while you enjoy viewing another program.
This permits the recorded program to be played back later at your convenience.

The key points to be remembered are:

- Select the channel you wish to record with the recorder's channel selector.
- Select the channel you wish to view with the TV receiver's channel selector.
- The VIDEO/TV switch should be in the TV position. Press it down so that the VIDEO indicator extinguishes.

1.15 AUTOMATIC TIMER RECORDING

The built-in 7-day programmable timer permits recording of preset channels on preset day, at preset times for preset lengths while you are away.

Basic procedure for setting the HR-6700U for unattended recording

1. Load a cassette whose tape length is sufficient for the sum of your intended recordings.

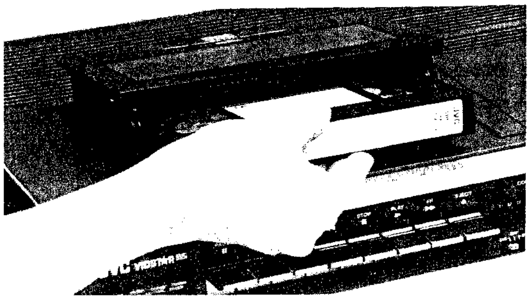


Fig. 1-34

2. Set the SP/EP recording mode select switch as required.

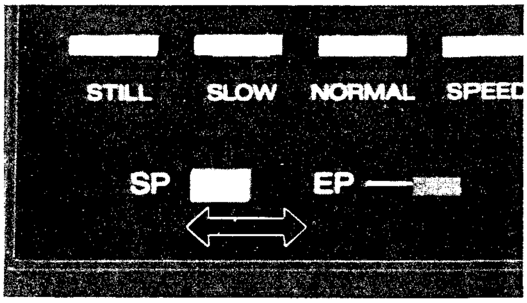


Fig. 1-35

3. Set the REC SELECT switch to TV.

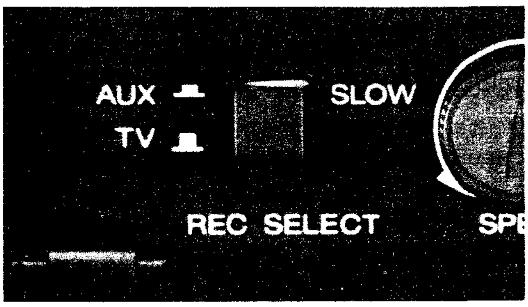


Fig. 1-36

4. Preset the timer following the detailed instructions given later.

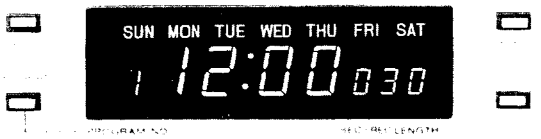


Fig. 1-37

5. Set the FUNCTION switch to TIMER.

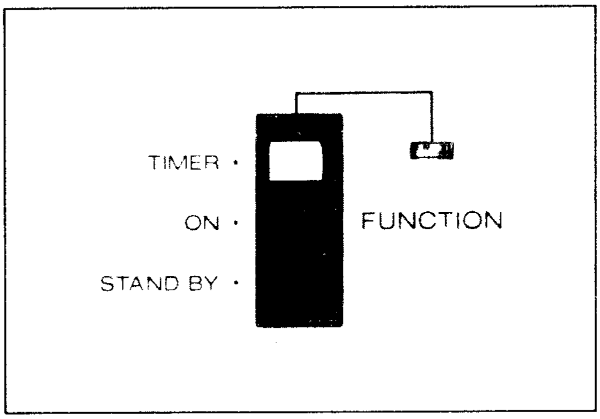


Fig. 1-38

6. Depress the REC and PLAY keys simultaneously.

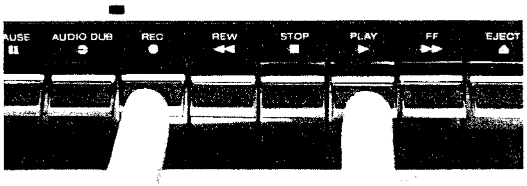


Fig. 1-39

NOTES:

- *Make sure that the NORMAL button of the variable speed control buttons is depressed.*
- *Also check the setting of the remote control unit or the remote control switch, if connected.*
- *Return the FUNCTION switch to STANDBY when you return home.*

How to preset the timer

The built-in microcomputer has a capacity for memorizing 6 different program settings; each program contains a channel, day (or days), time and recording length.

1. Set the display function select switch to PROGRAM SET.

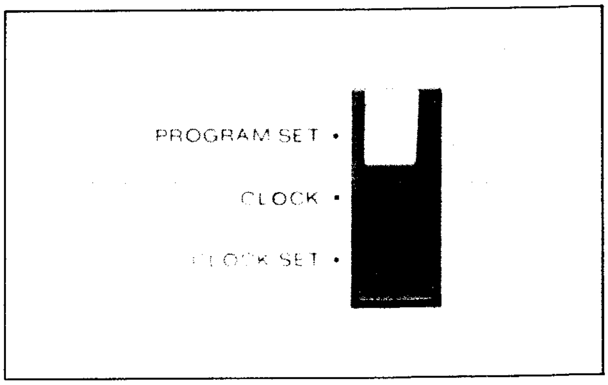


Fig. 1-40

- You will see "1" in the left bottom corner of the display.
- Now you are ready to preset the timer for program "1".
- If the red channel presetting indicator is flashing, proceed to next step. If not, press the SELECT button once, and the indicator will start flashing.

2. Press the SET button until the desired channel numeral flashes.

- The flashing channel is the one which will be recorded at a preset time.
- The lit channel is the one to which the tuner is presently set for receiving off-the-air programs.
- If the "lit" and "flickering" indications should happen to correspond to the same channel, that channel number will light only and not flicker.

3. Press the SELECT button, and then the next item for setting – day – will start flashing.
4. Press the SET button until the desired day – or all the days of the week (which appear after Saturday), if you wish to record a program every day at the same time – is displayed.
5. Press the SELECT button, and then the next item for setting – hour – will start flashing.
6. Press the SET button to obtain a desired hour indication.
7. Press the SELECT button, and the next item for setting – minute – will start flashing.
8. Press the SET button to obtain a desired minute indication.
9. Press the SELECT button, and the next item for setting – recording length – will start flashing.
10. Press the SET button to obtain a desired recording length.

Example:

Let's follow the steps again assuming that you wish to preset the timer for program "1" to record a TV show which will be televised on channel 6 Wednesday at 12:30 for 30 minutes.

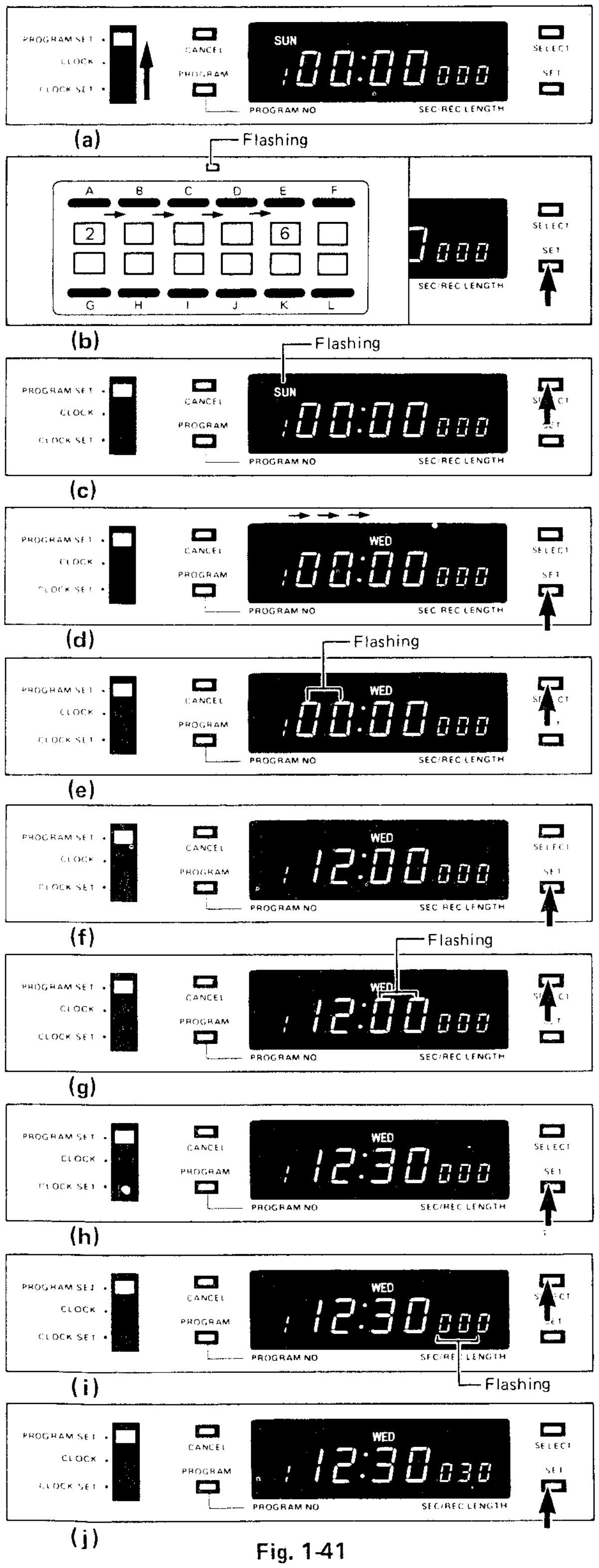


Fig. 1-41

Now you have finished presetting the timer for program "1". If you need another preset program, press the PROGRAM button, and "2" will be displayed for the next program setting. You can start the same procedure as mentioned above.

- Programs "1", "2" and "3" are cleared after the recorder has functioned as preset. Employ these programs to record a single, specified TV show or a daily TV show for 7 days.
- Programs "4", "5" and "6" are maintained until manually cancelled. Employ these programs if you wish to record a daily TV show longer than 7 days or weekly TV show each week continuously.
- Holding the SET button pressed for more than 1 second advances the indication rapidly and pressing it once advances the indication in single increments only.
- After finishing presetting all the necessary programs, return the display function select switch to CLOCK.
- The preset programs can be cancelled by pressing the CANCEL button after obtaining the corresponding program number on the display.
- The preset data can be called out any time for checking by setting the display function select switch to PROGRAM SET and pressing the PROGRAM button to obtain the corresponding program number on the display.
- If you wish to change the preset data partially, press the SELECT button until the corresponding position starts flashing and enter the new data by pressing the SET button.
- If you wish to cancel all preset data for programs 1 through 6, press the CANCEL button while holding the PROGRAM button pressed. Then all 6 programs will be cleared and program No. 1 will be displayed.
- When recording a daily TV show using programs 1 through 3, the illumination of days will extinguish one by one as each specific recording has been made for the corresponding day. Therefore, you can easily check the recordings that have been made by calling up the corresponding program number on the display.
- If you have preset two programs for the same day and same switch-on time, the setting corresponding to the smaller program number has priority.
- If two programs have preset times which overlap, the recording starts with the first preset time and the preset information is replaced when the preset switch-on time for the next recording is reached. For example, if you preset program "1" for recording on channel 4 from 13:00 to 14:00 one day and if someone else should preset program "2" for recording on channel 6 from 13:30 to 14:30 on the same day, your record-

ing will contain the broadcast on channel 4 for the first 30 minutes, followed with an hour's recording of channels 6's broadcast. This kind of mishap is likely to occur between new settings for programs No. 1 to No. 3 and settings retained for programs No. 4 to No. 6. Please confirm the time settings of programs No. 4 to No. 6 before entering the new data.

- It is impossible to alter the programmed data during actual timer recording.

Power failure indicator

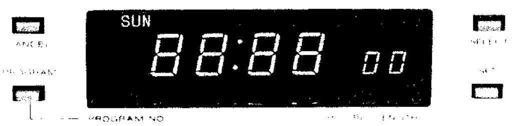


Fig. 1-42

- Even though a power failure should occur, timekeeping continues and the preset data are maintained if it is only for a short period (about 10 minutes).
- When the period of power outage exceeds this, timekeeping stops and the memorized data are cancelled. A flashing SUN 88:88 00 indicates this after power has been re-applied.
- First correct the time indication and then re-enter the program data.

1.16 RECORDING WITH A VIDEO CAMERA

1. Connect a video camera to the front panel CAMERA connector.

NOTE: If line input is used, it will be defeated when camera is connected.

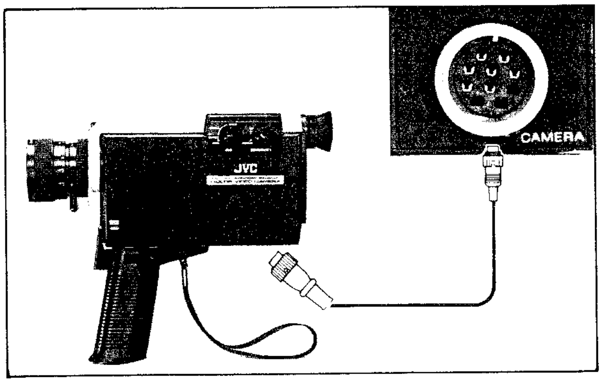


Fig. 1-43

2. Turn the recorder and TV receiver power ON.
3. Set the TV receiver's channel selector to your video channel (3 or 4).
4. Set the REC SELECT switch on the sub-control panel to AUX.

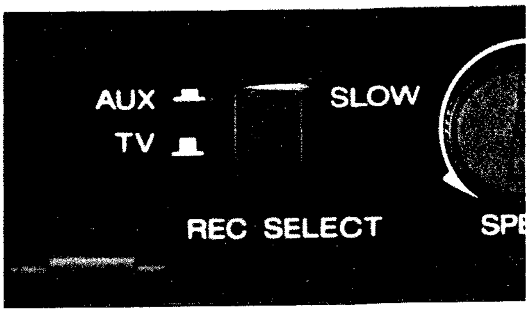


Fig. 1-44

5. Make sure that the VIDEO indicator is lit.
6. Depress the REC and PLAY keys simultaneously. The recorder enters the Recording standby mode.

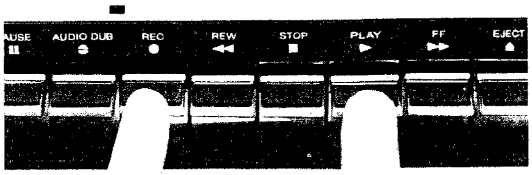


Fig. 1-45

7. Operate the camera's start/stop switch. Now recording will start.

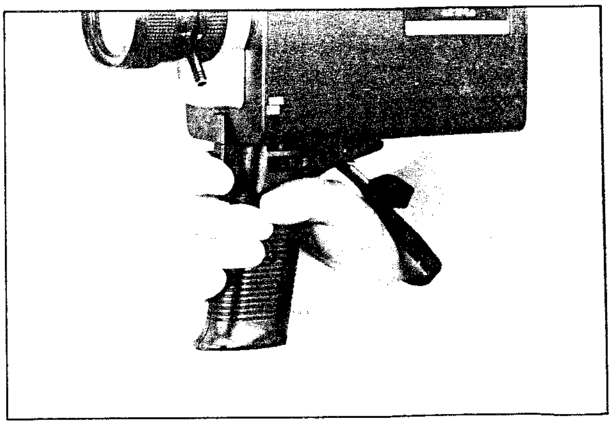


Fig. 1-46

NOTES:

- *If feedback noise (whistling or howling) is heard from the TV receiver, reduce the volume or move the microphone, either external or built within the camera, farther away from the TV receiver.*

- *If the PAUSE key is depressed, or if the PAUSE/STILL button on the remote control unit has been pressed, the camera's start/stop switch does not function to control the tape transport. Release the PAUSE key or press the NORMAL button on the remote control unit. This caution applies to the RM-42 remote control switch, if it is connected.*
- *Power to the camera is switched on or off with the FUNCTION switch or by using the built-in timer.*
- *With some cameras their battery power warning indicator may flicker, however, there is no trouble with recording as long as the picture being monitored on the TV screen appears normal.*

1.17 AUDIO DUBBING

Audio dubbing means recording a sound track on a pre-recorded cassette. Sound from a source connected to the rear panel AUDIO IN jack, or from a microphone connected to the front panel MIC jack, or a mixture of the two can be recorded.

1. Load the pre-recorded tape, and set the TV channel selector to the video channel to monitor the playback picture.
2. Make sure that the VIDEO indicator is lit.
3. Set the REC SELECT switch to AUX.
4. Depress the AUDIO DUB and PLAY keys simultaneously.

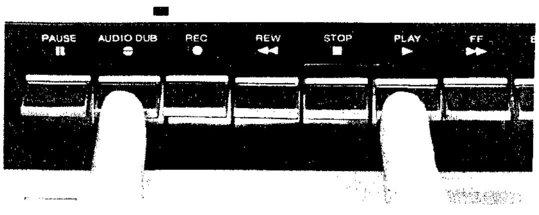


Fig. 1-47

NOTES:

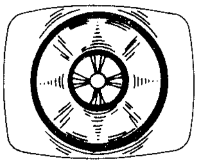
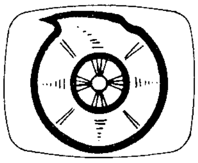
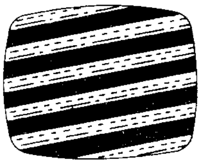
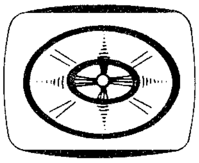
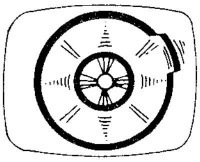
- *Use a high impedance microphone.*
- *If sound is recorded along with the picture on the pre-recorded tape, it can be replaced with a new sound track by audio dubbing.*
- *If a whistling or howling noise is heard during audio dubbing, reduce the TV volume or move the microphone farther away. Recording is being performed even if sound is not heard from the TV receiver.*
- *If you want to monitor the sound being recorded, connect headphones to the PHONES jack.*
- *The Pause function facilitates audio dubbing. First play back the pre-recorded tape and depress the PAUSE key (or the PAUSE/STILL button on the remote control unit), at the point from which you wish to start sound dubbing. Then depress the AUDIO DUB key and release the PAUSE key (or press the NORMAL button when using the remote control unit). This permits you to start audio dubbing immediately following a previously recorded program.*

Caution:
When using audio dubbing, make sure that you are in the Normal speed mode. When attempting to dub audio in the Speed or Slow playback mode, and playing back at normal speed, the sound's pitch will be changed.

1.18 ADJUST YOUR RECEIVER.

Speed playback, Slow-motion playback or Still playback may require adjusting your TV receiver.

If your TV receiver shows the following symptoms during Speed playback, Slow-motion playback or Still playback using the HR-6700U, adjust the TV receiver first.

Symptoms	**Picture vibrates vertically.** 	**The upper portion of the picture drifts horizontally.** 	**Picture rolls.** 	**Picture is flattened vertically.** 	**Only a portion of the picture continues to flicker.** 
Adjust-ments	Turn the V-Hold knob slightly for stabilizing.*	Turn the H-Hold knob slightly for stabilizing.**	Turn the H-Hold knob slightly for stabilizing.**	Inherent in your TV receiver.	Not adjustable. Inherent in your TV receiver.

* If an unsatisfactory result is obtained, adjust the V. LOCK ADJ (Vertical Lock Adjustment) screw located at the rear of the unit so that a stable picture is obtained.

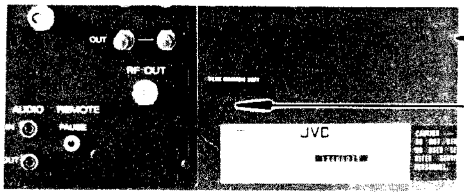


Fig. 1-48 V. LOCK adjustment

** If an unsatisfactory result is obtained, it is necessary to adjust the AFC circuit of the TV receiver.

SECTION 2
CIRCUIT DESCRIPTION

2.1 STILL, SLOW MOTION AND SPEED PLAYBACK

The VHS system achieves reduced tape consumption by eliminating the earlier guard band and adopting an azimuth recording pattern. Because of this, the track recorded by the channel-1 head cannot be played back by the channel-2 head. Initially, the provision of still and slow motion functions was considered unfeasible. However, the problem has been surmounted by adopting a wider head, which allows low noise still, slow and speed playback without changing the tape running angle.

2.1.1 Still playback

In the normal video signal, each frame is comprised of two fields. When only one of these frames (i.e., 2 fields) is played back repeatedly, the visual effect is that of a stopped picture. The principle of the still playback system for an earlier VHS model is illustrated in Fig. 2-1.

As shown in the figure, consider situations ①, ②, and ③. A 12° relative azimuth angle is provided between the two heads and when one head traces the other's recorded pattern, the FM waveform output becomes negligible. This causes considerable picture loss (FM loss) in all ①, ② and ③ cases, preventing a usable still image.

By giving the CH-1 output priority, case ① becomes the optimum FM output. In order to obtain this simultaneously with an adequate CH-2 output, the CH-2 installation height (relative height with respect to the CH-1 head) would have to be changed. But physically changing the head height would both adversely affect recording and lose interchangeability with VHS specifications.

One means for resolving this problem is to increase the track width of the head, which in effect is the same as increasing the installation height. This is shown in Fig. 2-2. The shaded areas indicate the CH-1 pattern and the unshaded areas the CH-2 pattern in the Normal mode. During the Still mode, the head traces become slanted slightly due to the change in head to tape relative speed, as shown by the broken outlines in the figure. As can be noted, the widened CH-2 trace extends past the CH-1 pattern (from which a signal is not obtained) and also covers a portion of the next CH-2 segment. The resulting output greatly alleviates the signal loss indicated in Fig. 2-1.

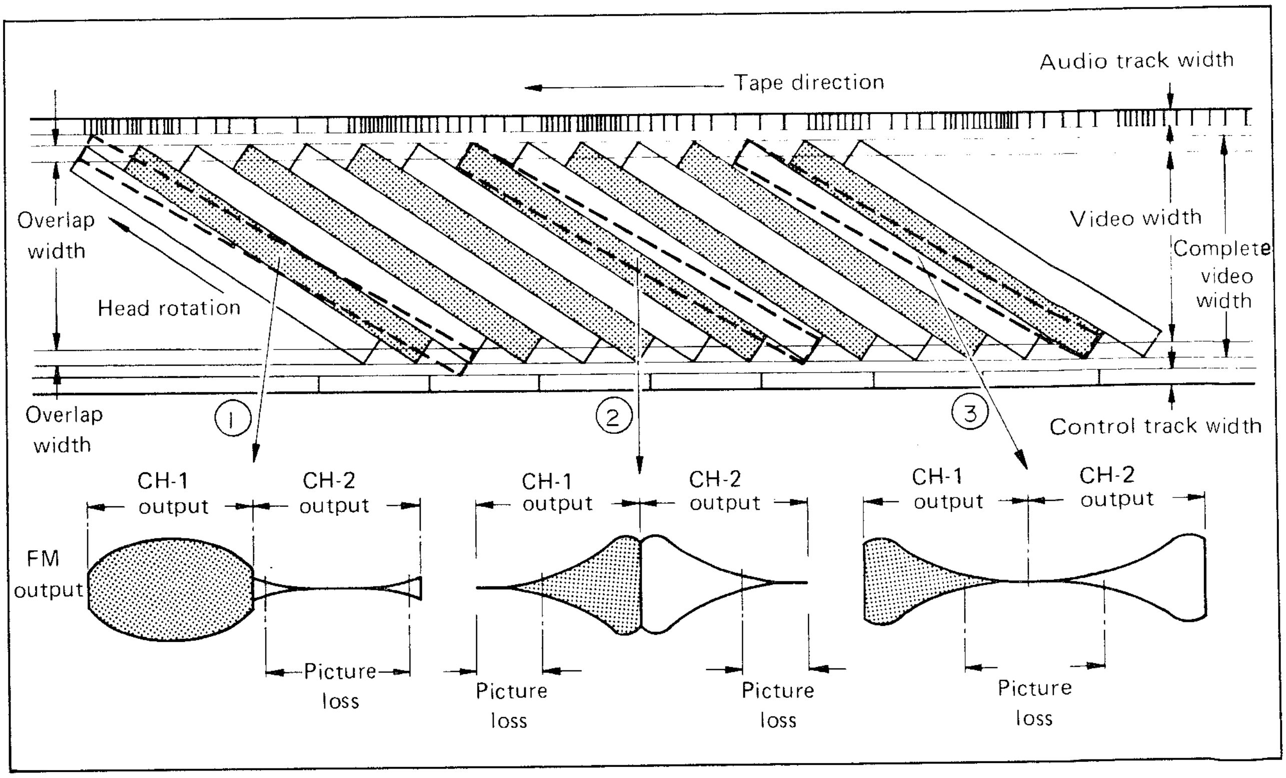

Tape direction
Audio track width
Overlap width
Head rotation
Video width
Complete video width
Overlap width
①
②
③
Control track width
CH-1 output
CH-2 output
FM output
Picture loss
CH-1 output
CH-2 output
Picture loss
Picture loss
CH-1 output
CH-2 output
Picture loss

Fig. 2-1 Obsolete still playback system

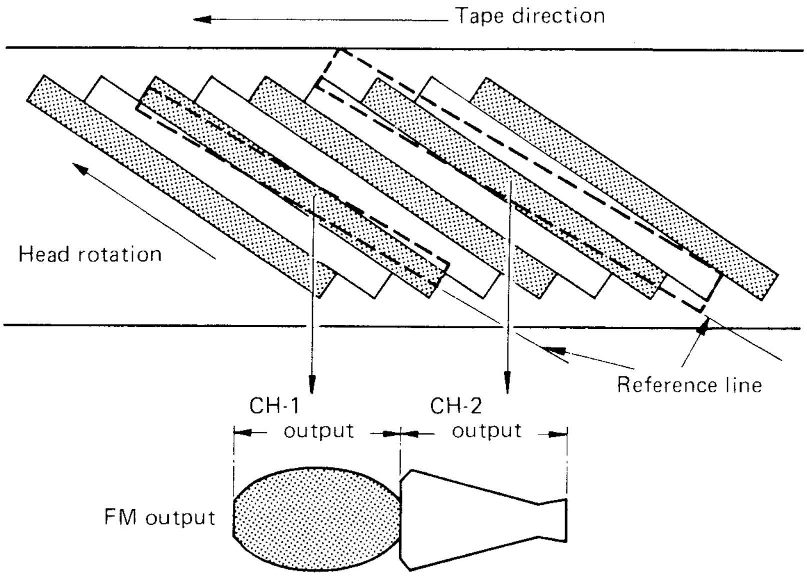

Tape direction
Head rotation
Reference line
CH-1 output
CH-2 output
FM output

Fig. 2-2 Increased CH-2 head track width

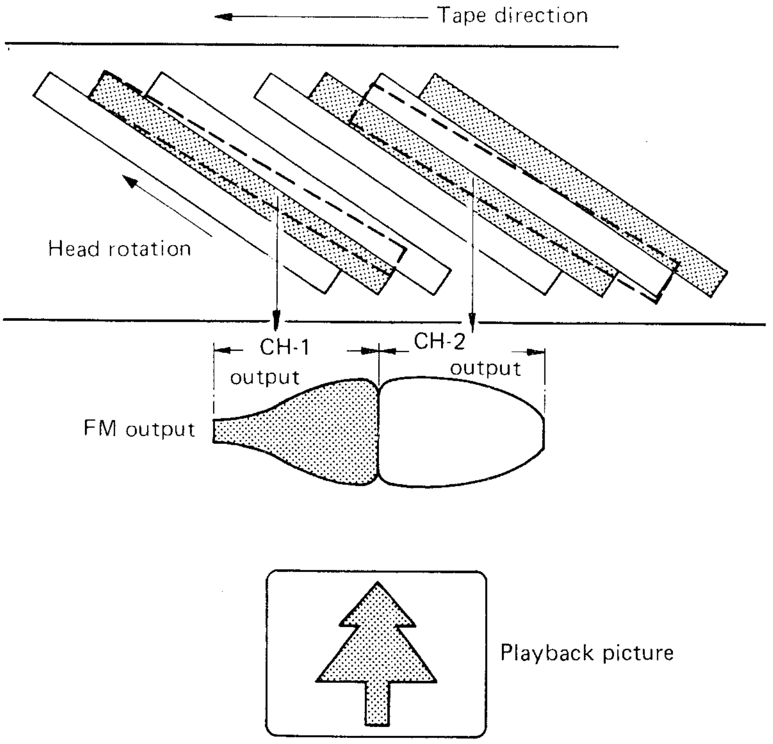

Tape direction
Head rotation
CH-1 output
CH-2 output
FM output
Playback picture

Fig. 2-3 Still playback image

A further refinement of this idea is shown in Fig. 2-3. In this, the FM output becomes larger only to the extent the CH-2 head is widened, yielding better balance between the channels.

When set to the Still mode, since the tape stopping position is random, the less than optimum playback head trace produced bar noise in the picture. Previous machines included a manually operated control for adjusting the position of the bar noise. In this series, automatic adjustment is provided by detecting the control signal.

NOTE:

Since two video fields are covered during Still and Slow Motion playback, in scenes with very rapid movement, the two fields may not contain the same information, leading to vertical or horizontal shaking in the reproduced picture. However, this is inherent in the system and does not pose difficulty in ordinary applications.

2.1.2 Slow motion playback

In earlier simple slow motion systems, bar noise resulted from the oblique tracing of the recorded pattern by the playback heads. This model features greatly reduced bar noise by performing slow motion playback as an alternation between Still and Normal playback modes. Significant points of this system are as follows.

1. Tracking widths of both CH-1 and CH-2 heads are widened (however, CH-1 is smaller than CH-2).
2. As shown in Fig. 2-3, the tape stopping position is at the end point of the CH-1 head scanning. This allows CH-1 and CH-2 heads to accurately trace the recorded pattern.
3. The control head position has been moved (by a microscopic amount) closer to the head drum. This allows detection of the control pulse and stopping of the tape at the minimum noise position.
4. One frame of the picture is transported at Normal speed (in practice, 1/3rd Normal). At the beginning point of CH-2 head trace, voltage is applied to the capstan motor for transporting the tape. The tape then stops at the position indicated in Fig. 2-3.
5. While the heads rotate at normal speed (30 Hz), the tape is transported by alternating between stop and run. The reduced frame change rate has the visual effect of a moving picture slowed down to 1/4th to 1/30th the normal speed.
6. After voltage is supplied to the capstan motor, due to mechanical inertia, a small delay occurs before actual tape transport. Conversely, when the voltage is interrupted during the stop segment, complete stop is attained approx. 50 msec later.

2.1.3 Speed playback (of SP mode recording)

As shown in Fig. 2-4, the playback trace during the Speed mode is the opposite of that during Still. The tape speed is twice Normal mode and the playback inclination approaches the vertical. Every other track of the pattern is played back, as if a guard band were present. However, due to the expanded track widths of the heads, a low noise Speed mode picture can be obtained as shown in Fig 2-4.

NOTES:

- *The tracking angle during Still and Speed playback differs from that in recording by ±2 minutes. Although this produces about 2 minutes of azimuth loss, in practice it is nearly unobservable and not a problem in regard to the FM output.*
- *Some picture loss occurs during Still/Slow/Speed. When the loss component is applied to the vertical sync, vertical jitter can be produced on the playback monitor. For this reason, a 60 Hz synthesized sync signal is added.*
- *When an EP mode recording is played back in the Speed mode, the tape speed becomes 3 times that during recording (triple speed playback or 1H mode).*

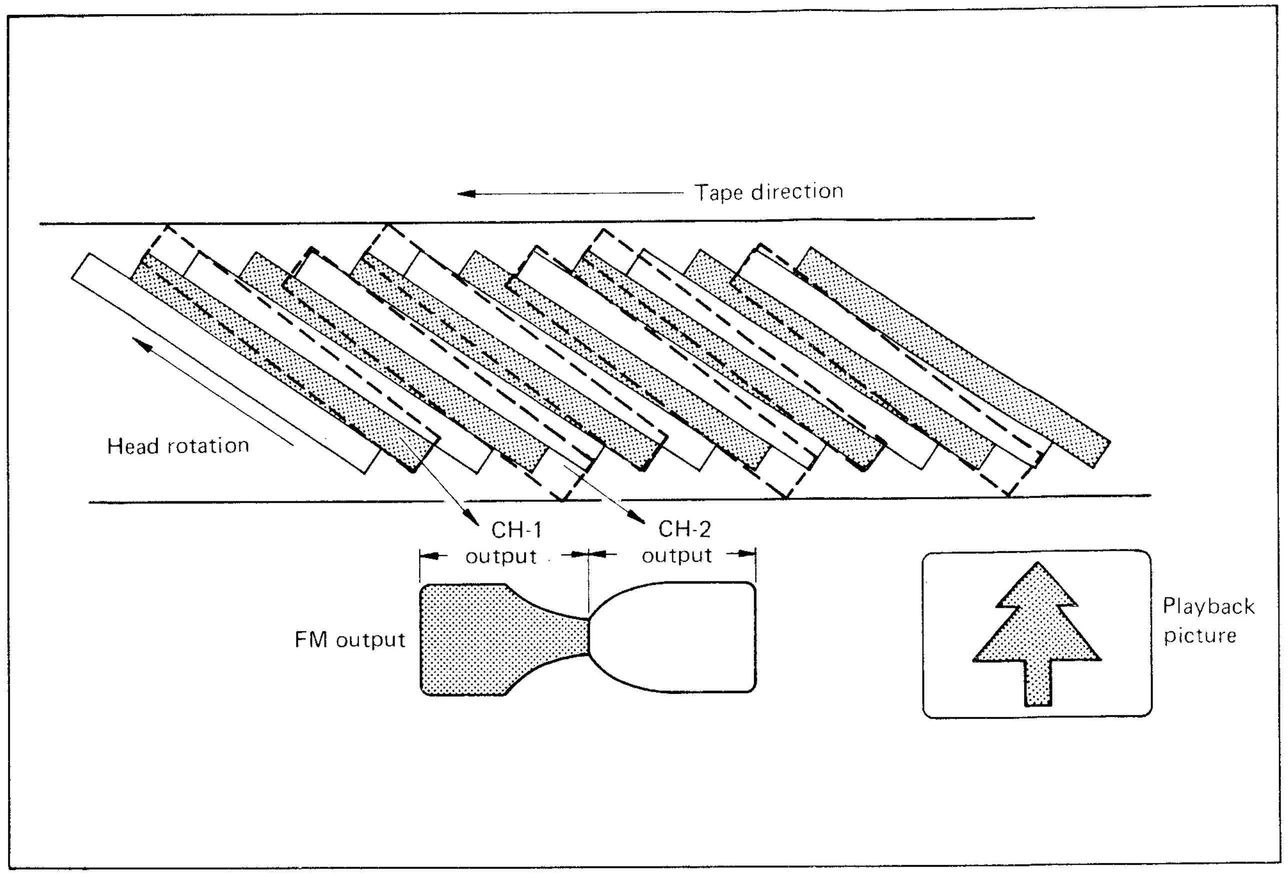


Fig. 2-4 Speed playback

2.2 DRUM SERVO SYSTEM

The drum servo system of this machine functions to maintain stable 30 Hz rotation of the video heads.

2.2.1 Recording mode

See Fig. 2-5.

1. Reference signal line
   Composite sync from the Y/COLOR board goes to terminal 11 of the SERVO board. A lowpass filter (LPF) removes the horizontal sync component and supplies the vertical sync component to IC4 pin 8. The vertical drive separation circuit shapes the waveform, after which it is counted down 1/2 to 30 Hz by a monostable (monostable multivibrator). Another monostable adjusts the signal to the REC switching phase and supplies it to the pulse generator for producing the sampling pulse. This becomes the reference signal supplied to the sample and hold circuit.
2. Comparison signal line
   The 30 Hz pulse from the drum pickup head goes to terminal 61 of the SERVO board, then to IC4 pin 19. CH-1 and CH-2 switching phases are adjusted by amplifiers and monostables, after which a flip-flop produces a 30 Hz squarewave. This is converted into a trapezoidal waveform, which becomes the comparison signal supplied to the sample and hold circuit.
3. Phase error signal and MDA (motor drive amplifier)
   From the sample and hold circuit (IC4, pin 12) the phase error signal is supplied to a limiter composed of D2 and D3, which limits the signal voltage to the range of DC 6.3 ± 0.7 V. After the limiter, the signal goes to discriminator IC9. Via the MDA (X6, X7, X1), IC9 pin 7 output controls the drum motor rotation.

NOTE: *The discriminator and MDA circuits are essentially the same as those of earlier models. Detailed descriptions are therefore omitted here.*

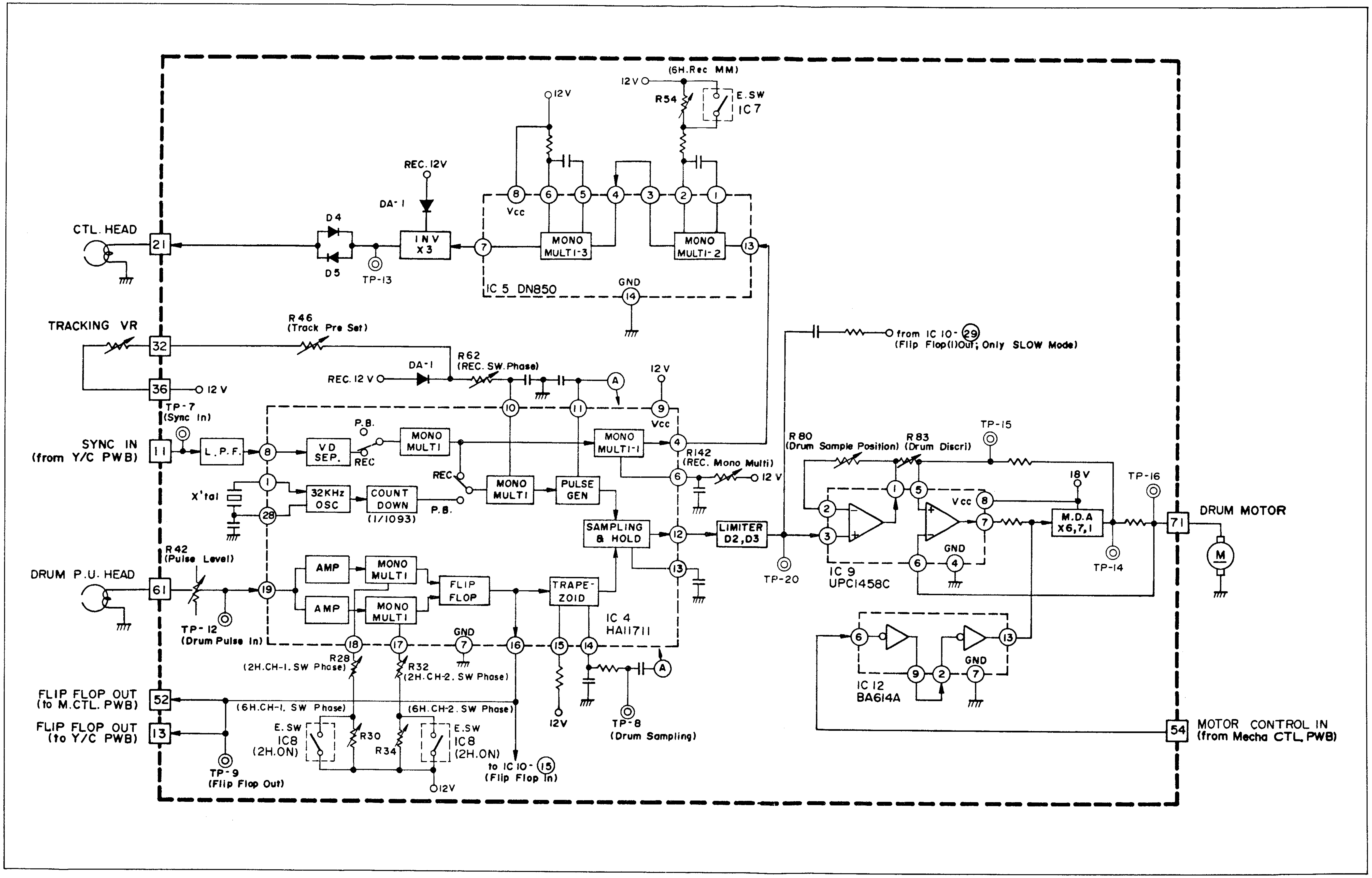

CTL. HEAD
21
D4
D5
TP-13
DA-1
REC. 12V
INV X3
7
MONO MULTI-3
MONO MULTI-2
13
IC 5 DN850
GND
14
8
Vcc
6
5
4
3
2
1
12V
(6H.Rec MM)
R54
E.SW
IC7
TRACKING VR
32
R46
(Track Pre Set)
36
12 V
DA-1
REC. 12 V
R62
(REC. SW. Phase)
A
12 V
from IC 10-29
(Flip Flop(1)Out; Only SLOW Mode)
TP-7
(Sync In)
SYNC IN
(from Y/C PWB)
11
L.P.F.
8
VD SEP.
P.B.
REC
MONO MULTI
10
11
9
Vcc
MONO MULTI-1
4
R142
(REC. Mono Multi)
12 V
X'tal
1
28
32KHz OSC
COUNT DOWN
(1/1093)
P.B.
REC
MONO MULTI
PULSE GEN
6
SAMPLING & HOLD
12
LIMITER D2,D3
13
TP-20
R80
(Drum Sample Position)
R83
(Drum Discri)
TP-15
18V
TP-16
Vcc
GND
M.D.A
X6,7,1
TP-14
IC 9
UPC1458C
71
DRUM MOTOR
M
R42
(Pulse Level)
DRUM P.U. HEAD
61
19
AMP
AMP
MONO MULTI
MONO MULTI
FLIP FLOP
TRAPE-ZOID
IC 4
HA11711
TP-12
(Drum Pulse In)
18
17
GND
7
16
15
14
R28
(2H.CH-1. SW Phase)
R32
(2H.CH-2. SW Phase)
A
TP-8
(Drum Sampling)
12V
IC 12
BA614A
GND
6
13
9
2
7
FLIP FLOP OUT
(to M.CTL. PWB)
52
FLIP FLOP OUT
(to Y/C PWB)
13
(6H.CH-1. SW Phase)
(6H.CH-2. SW Phase)
E.SW
IC8
(2H.ON)
R30
R34
E.SW
IC8
(2H.ON)
TP-9
(Flip Flop Out)
12V
to IC 10-15
(Flip Flop In)
54
MOTOR CONTROL IN
(from Mecha CTL PWB)

Fig. 2-5 Drum servo block diagram

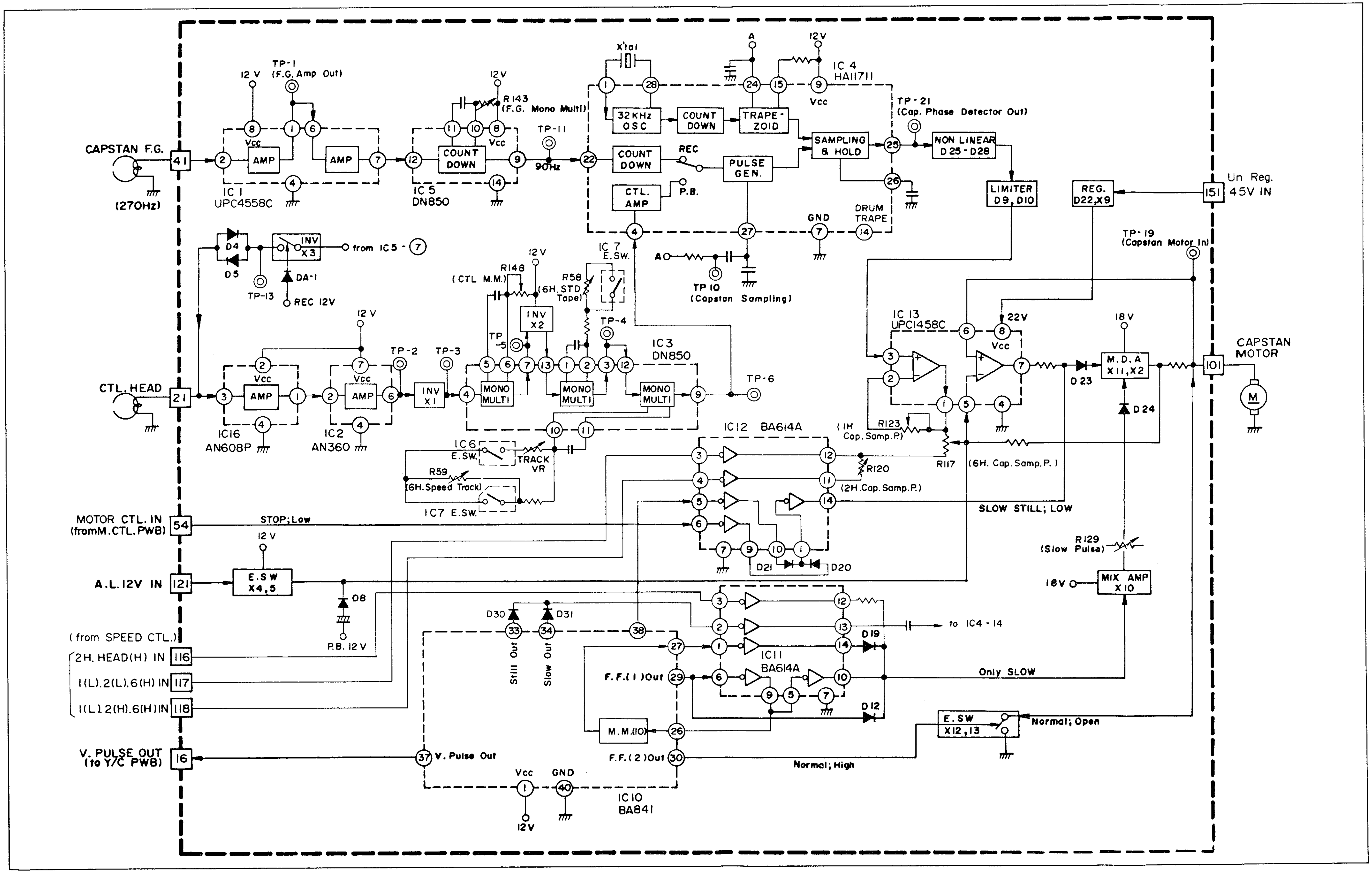

CAPSTAN F.G.
(270Hz)
41
12 V
TP-1
(F.G. Amp Out)
Vcc
AMP
IC 1
UPC4558C
12V
R143
(F.G. Mono Multi)
COUNT DOWN
IC 5
DN850
TP-11
90Hz
X'tal
32 KHz OSC
COUNT DOWN
TRAPE-ZOID
A
12V
IC 4
HA11711
Vcc
SAMPLING & HOLD
REC
PULSE GEN.
CTL. AMP
P.B.
GND
DRUM TRAPE
TP-21
(Cap. Phase Detector Out)
NON LINEAR
D 25 - D28
LIMITER
D9, D10
REG.
D22,X9
151
Un Reg.
45V IN
TP-19
(Capstan Motor In)
D4
D5
INV
X3
from IC5 - 7
DA-1
TP-13
REC 12V
TP 10
(Capstan Sampling)
(CTL M.M.)
R148
12V
(6H. STD Tape)
R58
IC 7
E.SW.
INV
X2
TP-4
TP-5
IC3
DN850
MONO MULTI
TP-6
CTL. HEAD
21
AMP
IC16
AN608P
IC2
AN360
TP-2
TP-3
INV
X1
IC6
E.SW.
TRACK VR
R59
(6H.Speed Track)
IC7 E.SW.
IC 13
UPC1458C
22V
18 V
M.D.A
X11,X2
D 23
D 24
CAPSTAN MOTOR
101
M
(1H Cap. Samp.P.)
R123
R117
(6H. Cap. Samp.P.)
IC12 BA614A
R120
(2H.Cap.Samp.P.)
SLOW STILL; LOW
MOTOR CTL. IN
(fromM.CTL.PWB)
54
STOP; Low
D21
D20
R129
(Slow Pulse)
18V
MIX AMP
X10
A.L.12V IN
121
E.SW
X4,5
D8
P.B. 12V
D30
D31
33
34
Still Out
Slow Out
38
IC11
BA614A
to IC4 - 14
D19
D12
Only SLOW
(from SPEED CTL.)
2H. HEAD(H) IN
116
1(L).2(L).6(H) IN
117
1(L).2(H).6(H) IN
118
F.F.(1)Out
M.M.(10)
E.SW
X12,13
Normal; Open
V. PULSE OUT
(to Y/C PWB)
16
V. Pulse Out
F.F.(2)Out
Normal; High
Vcc
GND
IC 10
BA841
12V

Fig. 2-6 Capstan servo block diagram

4. Motor control line
The base of MDA X6 goes low when low potential appears at terminal 54 of the SERVO board. X6 and X7 become off and voltage is not applied to the drum motor, i.e., the motor does not rotate. This control signal is obtained from mechanism control IC1 pin 6.

2.2.2 Playback mode

See Fig. 2-5.

1. Reference singal line
Signal source is a 32 kHz crystal oscillator. This output is counted down in SERVO board IC4 to 30 Hz and supplied to a monostable for tracking adjustment. The result goes to the pulse generator for producing the sampling pulse. This becomes the playback reference signal sent to the sample and hold circuit.
2. Comparison signal line
This is the same as for the Recording mode.

2.3 CAPSTAN SERVO SYSTEM

2.3.1 Recording mode

See Fig. 2-6.

1. Reference signal line
A 32 kHz oscillator functions from a crystal between pins 1 and 28 of SERVO board IC4. This is counted down to 30 Hz and sent to the trapezoidal waveform shaper. The result goes as reference signal to the sample and hold circuit.
2. Comparison signal line
IC1 of the SERVO board amplifies the 270 Hz (SP mode) signal from the capstan flywheel FG. This is counted down 1/3rd and sent as a 90 Hz squarewave to IC4 pin 22. The squarewave is counted down further to 30 Hz and via the pulse generator, goes as the comparison signal to the sample and hold circuit.
3. Phase error signal and MDA
The phase error signal is obtained from the sample and hold circuit. From IC4 pin 25, the signal is supplied to a non-linear circuit composed of D25 to D28 and simultaneously to a limiter (D9 and D10) for fixing the signal voltage at DC 6.3 ± 0.7 V. After limiting, the signal goes through discriminator IC13 and MDA X11 and X12. The MDA then supplies the voltage to the capstan motor.
4. Tape speed selection during recording
Selection is performed by setting the front panel SP/EP mode selector switch to SP for 2 hour recording or EP for 6 hour recording (both with T-120 tape).
   1) EP (6H mode)
   When high voltage is applied to either terminal 117 or 118 of the SERVO board, pins 11 and 12 of IC12 become grounded. The voltage adjusted by R117 (6H CAPSTAN SAMPLE POSITION) goes to IC13 pin 5. The capstan motor then rotates with approx. 2.3 VDC power and the tape speed becomes 1/3rd that of the SP mode.
   2) SP (2H mode)
   When low voltage is applied to terminal 117 and high voltage to 118 of the SERVO board, IC12 pin 12 becomes open and pin 11 grounded. This connects R120 and R121 in series with R119 and ground. Approx. 6.3 VDC is applied to IC13 pin 5 and the capstan motor rotates with this voltage.

NOTES:

- *Playback operations in these modes are the same as for recording.*
- *During playback in the Speed mode, either terminal 117 or 118 becomes low, opening either pin 11 or 12 of IC12. Approx. 12 VDC is supplied to IC13 pin 5 and the capstan motor rotates with this voltage. Tape speed becomes twice that of the SP mode.*

5. Recording control signal
Refer to the timing chart of Fig. 2-7, which indicates the phase of the control pulse during recording.

2.3.2 Standard (SP) playback mode

See Fig. 2-6.

1. Reference signal line
This is the same as for the Recording mode, i.e., a 30 Hz trapezoidal signal is produced from the crystal oscillator frequency.
2. Comparison signal line
The control head picks up the control signal from the tape and supplies it to amplifiers IC16 and IC2. X1 operates only during playback and transfers the signal to monostable IC3. This monostable functions to maintain a fixed output with a 30 Hz, 60 Hz or 90 Hz input. Another monostable provides tracking adjustment

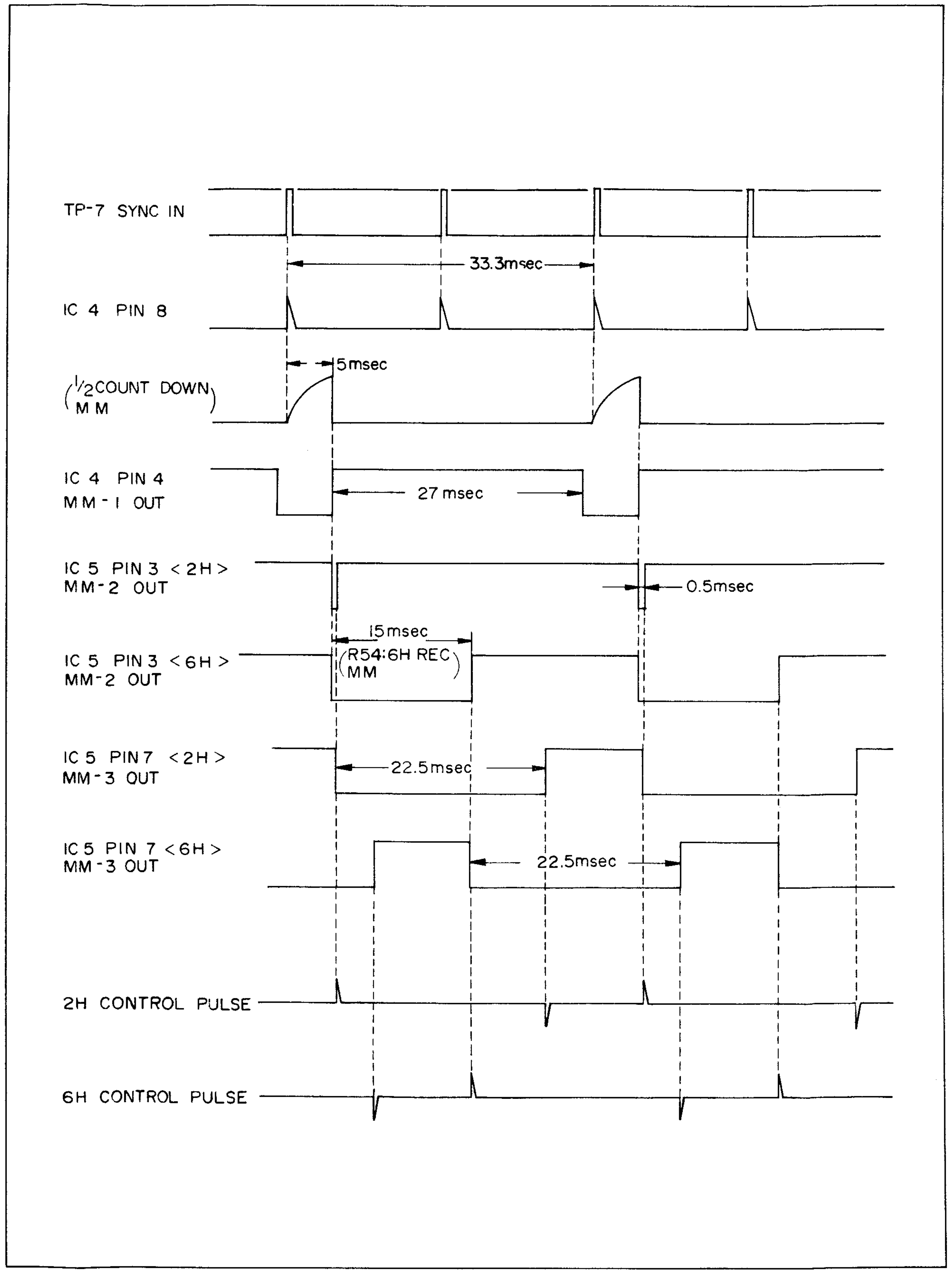


Fig. 2-7 Rec control pulse

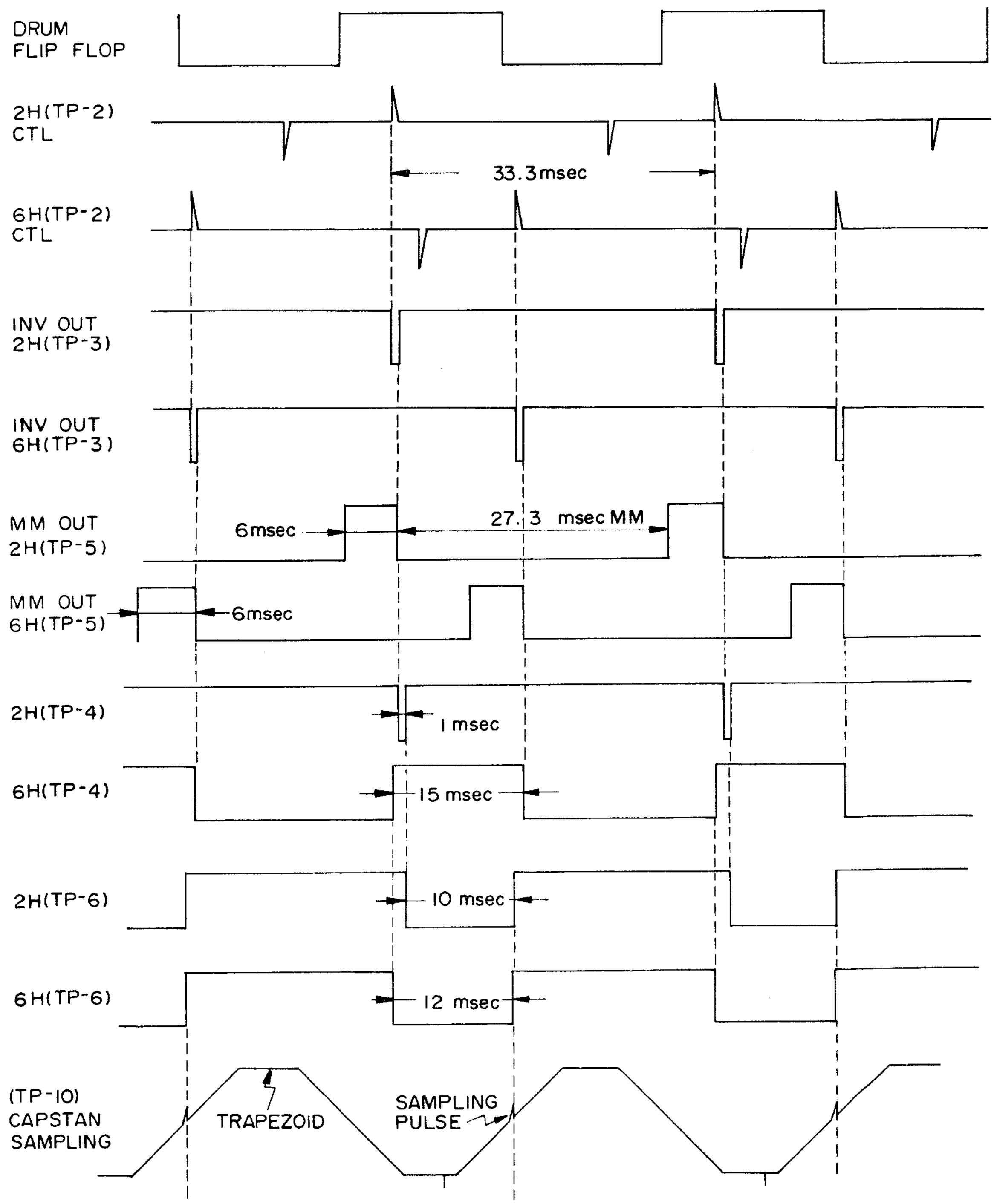

DRUM
FLIP FLOP
2H(TP-2)
CTL
33.3msec
6H(TP-2)
CTL
INV OUT
2H(TP-3)
INV OUT
6H(TP-3)
MM OUT
2H(TP-5)
6msec
27.3 msec MM
MM OUT
6H(TP-5)
6msec
2H(TP-4)
1 msec
6H(TP-4)
15 msec
2H(TP-6)
10 msec
6H(TP-6)
12 msec
(TP-10)
CAPSTAN
SAMPLING
TRAPEZOID
SAMPLING
PULSE

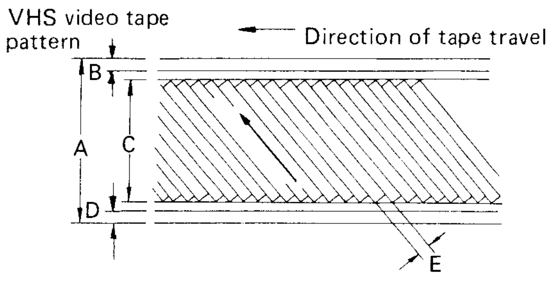
Fig. 2-8 Capstan playback timing chart

and supplies the signal to IC4 pin 4. Via the pulse generator, the comparison signal (sampling pulse) is produced and sent to the sample and hold circuit. The timing chart is shown in Fig. 2-8.

2.4 FOUR VIDEO HEAD SYSTEM

2.4.1 Outline

This is a VHS format machine capable of both standard play (SP 2H) and extended play (EP 6H). During the SP mode, the video tape pattern fulfills the VHS specifications noted in Fig. 2-9. As the figure shows, the video track pitch (E) is 58 microns and the tape speed is 33.4 mm/sec (1.31 inches/sec).



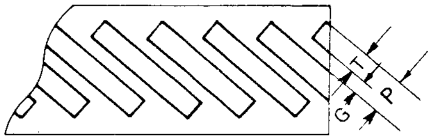
		Metric	Customary
	Tape speed	33.4 mm/s	1.31 in/s
A	Tape width	12.65 mm	0.5 in
B	Audio track	1.0 mm	0.04 in
C	Video tracks	10.6 mm	0.4 in
D	Control track	0.75 mm	0.03 in
E	Video track pitch	0.058 mm	0.00232 in

Fig. 2-9

2.4.2 Two head system

For the sake of illustration, consider an SP/EP model using the conventional two rotary video heads. Since the same heads are then used for both modes, the 1/3rd video track pitch of the EP mode requires a video head width of about 30 microns. However, this makes the video track of the tape pattern 30 microns wide and the remaining 28 microns in effect becomes a guard band.

Compliance with VHS specifications in the SP mode therefore becomes lost. For this reason, SP/EP models require four heads: two for the SP mode and two for the EP mode.



T(Video track pitch) ≒ 30 µm
G (Guard band) ≒ 28 µm
P (Pitch) ≒ 58 µm

Fig. 2-10

2.4.3 SP/EP head phase

As shown in Fig. 2-11, a 70° angle is provided between the SP and EP heads. In terms of time, this angle corresponds to approx. 6.5 msec. Compensation for this phase difference is performed by IC4 (pins 17 and 18) of the SERVO board. Fig. 2-12 illustrates the block diagram.

The electronic switches of IC8 are on in the SP mode and the CH-1 time constant becomes determined by R28 and C33, and the CH-2 time constant by R32 and C34. The monostable width is about 2 msec.

During the EP mode, the IC8 electronic switches are off. R30 and R34 are applied to CH-1 and CH-2, increasing the time constant. The flip-flop phase is then delayed 6.5 msec.

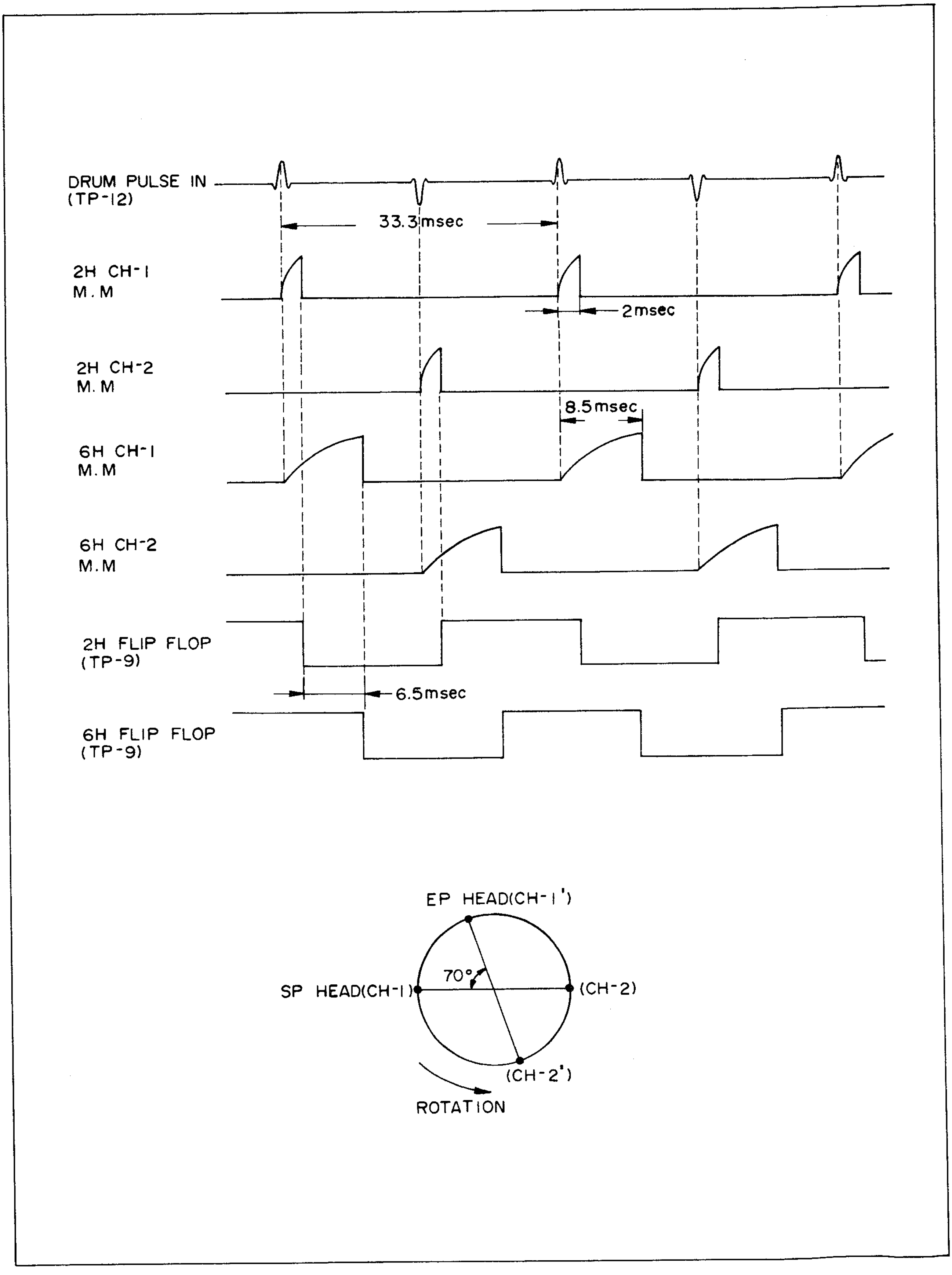

DRUM PULSE IN
(TP-12)
33.3 msec
2H CH-1
M.M
2msec
2H CH-2
M.M
8.5msec
6H CH-1
M.M
6H CH-2
M.M
2H FLIP FLOP
(TP-9)
6.5msec
6H FLIP FLOP
(TP-9)
EP HEAD(CH-1')
70°
SP HEAD(CH-1)
(CH-2)
(CH-2')
ROTATION

Fig. 2-11 SP/EP head phase

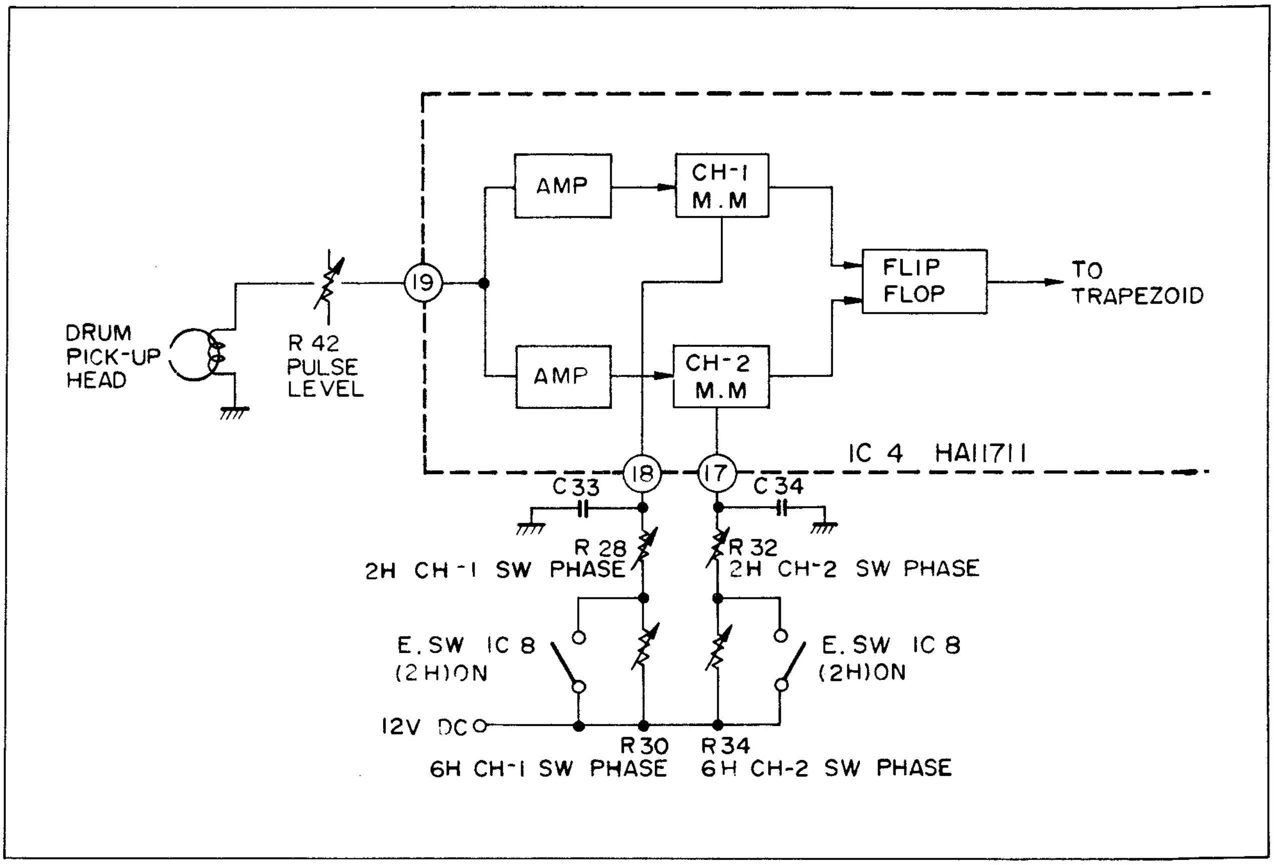

DRUM PICK-UP HEAD
R 42 PULSE LEVEL
19
AMP
AMP
CH-1 M.M
CH-2 M.M
FLIP FLOP
TO TRAPEZOID
IC 4 HA11711
18
17
C33
C34
R 28
2H CH-1 SW PHASE
R 32
2H CH-2 SW PHASE
E.SW IC 8 (2H)ON
E.SW IC 8 (2H)ON
12V DC
R30
6H CH-1 SW PHASE
R34
6H CH-2 SW PHASE

Fig. 2-12

2.5 SPEED CONTROL CIRCUIT

The main function of this circuit is to automatically detect the tape speed during playback. According to the tape playback data, a signal is generated for providing the appropriate tape speed.

2.5.1 Normal mode

1. Change from SP to EP

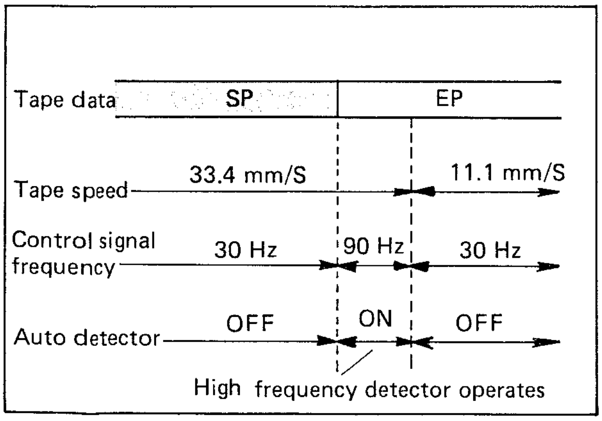

Tape data
SP
EP
Tape speed
33.4 mm/S
11.1 mm/S
Control signal frequency
30 Hz
90 Hz
30 Hz
Auto detector
OFF
ON
OFF
High frequency detector operates

Fig. 2-13

The control signal frequency changes from 30 Hz to 90 Hz. This is detected by a high frequency detector, after which the servo is instructed to set the proper speed.

2. Change from EP to SP

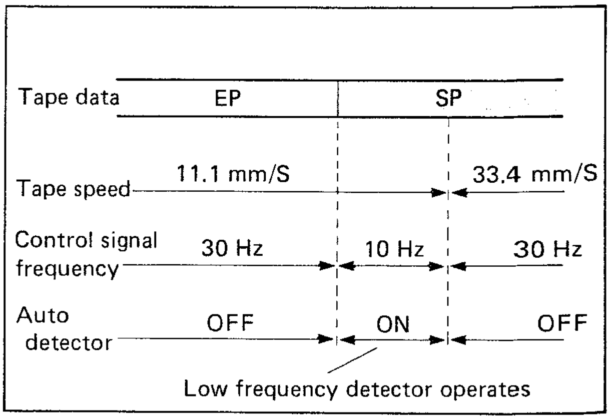

Tape data
EP
SP
Tape speed
11.1 mm/S
33.4 mm/S
Control signal frequency
30 Hz
10 Hz
30 Hz
Auto detector
OFF
ON
OFF
Low frequency detector operates

Fig. 2-14

The control signal drops from 30 Hz to 10 Hz. This is detected by a low frequency detector, after which the servo is instructed to set the proper speed.

2.5.2 Speed mode

1. Change from SP to EP

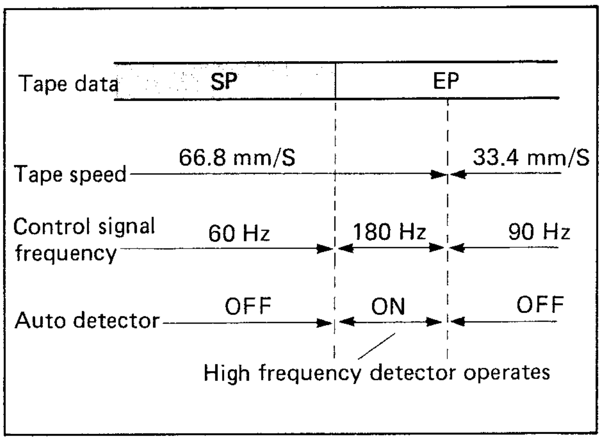

Tape data
SP
EP
Tape speed
66.8 mm/S
33.4 mm/S
Control signal frequency
60 Hz
180 Hz
90 Hz
Auto detector
OFF
ON
OFF
High frequency detector operates

Fig. 2-15

The control signal rises from 60 Hz to 180 Hz. This is detected by the high frequency detector, after which the servo is instructed to set the proper speed.

2. Change from EP to SP

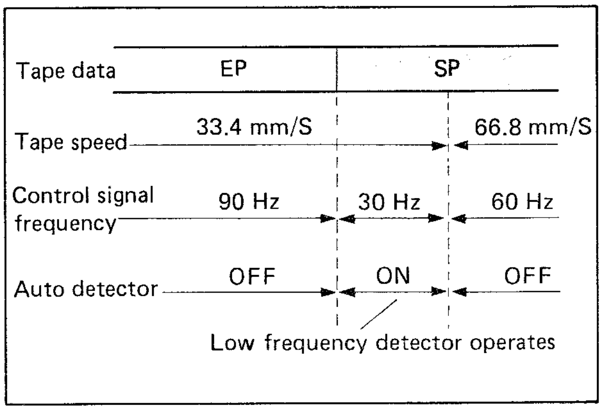

Tape data
EP
SP
Tape speed
33.4 mm/S
66.8 mm/S
Control signal frequency
90 Hz
30 Hz
60 Hz
Auto detector
OFF
ON
OFF
Low frequency detector operates

Fig. 2-16

The control signal drops from 90 Hz to 30 Hz. This is detected by the low frequency detector, after which the servo is instructed to set the proper tape speed.

2.5.3 Slow and Still modes

Automatic detection does not function in these modes. It operates when the machine is returned to the Play or Speed mode.

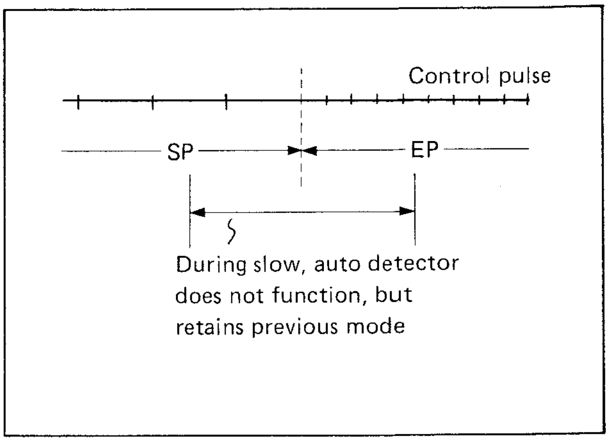

Control pulse
SP
EP
During slow, auto detector does not function, but retains previous mode

Fig. 2-17

2.5.4 Edge hold circuit

Fig. 2-18 illustrates this circuit. Its main functions are as follows.

1. At triple speed (EP recording played back in Speed mode), D24 is cut off and the audio squelch operates.
2. 1 H low output through D17 is supplied to terminal 45 .
3. In the Speed mode, the high frequency detector time constant is controlled through D2.

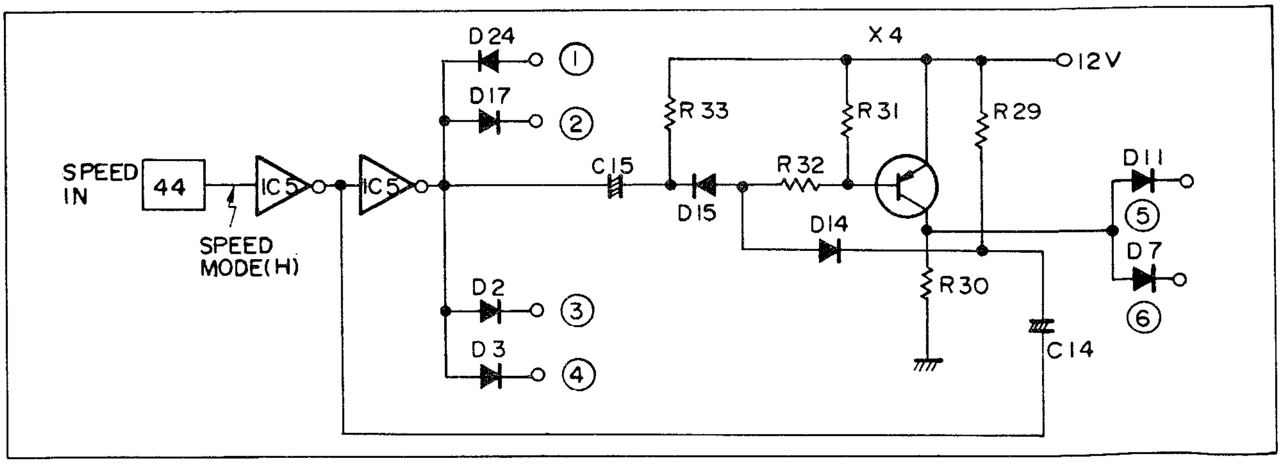

SPEED IN
44
IC5
IC5
SPEED MODE(H)
D24
①
D17
②
D2
③
D3
④
C15
R33
D15
R32
D14
R31
X4
R29
R30
C14
12V
D11
⑤
D7
⑥

Fig. 2-18 Edge hold

4. Time constant of the low frequency detector during the Speed mode is controlled through D3.
5. The Speed mode consists mainly of setting terminals 45 and 46 to low by high through D17. In order to avoid rotational instability at the start and end of the Speed mode, high is applied for 0.5 sec through D7 and D11 to IC4 flip-flop to hold the previous status before entering the Speed mode.

2.6 MECHANISM CONTROL CIRCUIT

2.6.1 Stop solenoid control

In addition to manually pressing the STOP key, the Stop mode becomes produced in the following situations.

1. Cassette housing not lowered to its locked position, i.e., cassette switch (SW7) not depressed.
2. Cassette lamp failure.
3. When light strikes the end sensor in the Play (REC) or FF mode.
4. When light strikes the start sensor in the REW mode.
5. In the Rewind mode, if the SEARCH switch (SW8) is set to COUNTER, the Stop mode becomes obtained when the counter indication decrements from 0000 to 9999. However, due to mechanical inertia, actual stopping occurs at about 9998.
6. If for some reason, the drum rotation is stopped during the Play (Record) mode (about 7 seconds later).
7. If recording Pause, Still Playback or Slow Motion Playback continues for more than 7 minutes.
8. When power is switched on while the FF or REW key is depressed.
9. If the power switch is set to off in modes other than Play (Record). If the Play (Record) mode is in progress, the Stop mode is not obtained in this case.
10. In all modes, if light is cut off to the tape guard phototransistor.
11. At the cue signal in the REW or FF mode when the SEARCH switch (SW8) is set to CUE.

2.6.2 Pause solenoid control

The pause solenoid operation is controlled in the following situations.

1. The pause solenoid changes from on to off when the PAUSE key is pressed during the REC mode to produce the REC Pause mode.
2. When the Pause signal is applied to the external remote terminals during the REC mode. The pause solenoid switches off, yielding the REC Pause mode.
3. Approx. 0.5 sec after SW5 (After Loading-1) closes during the REC or Play mode, the pause solenoid becomes on.

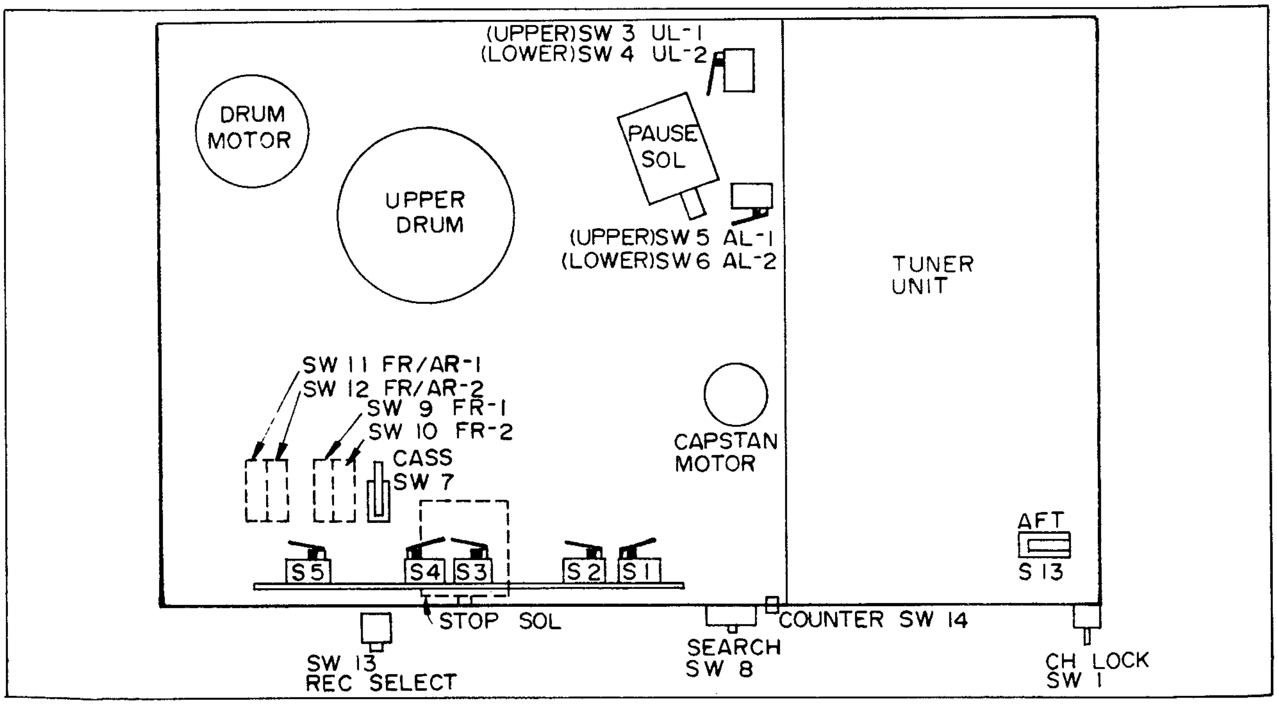

(UPPER)SW 3 UL-1
(LOWER)SW 4 UL-2
DRUM MOTOR
UPPER DRUM
PAUSE SOL
(UPPER)SW 5 AL-1
(LOWER)SW 6 AL-2
TUNER UNIT
SW 11 FR/AR-1
SW 12 FR/AR-2
SW 9 FR-1
SW 10 FR-2
CASS SW 7
CAPSTAN MOTOR
AFT
S 13
S5
S4
S3
S2
S1
STOP SOL
COUNTER SW 14
SEARCH SW 8
SW 13 REC SELECT
CH LOCK SW 1

Fig. 2-19 Switch layout

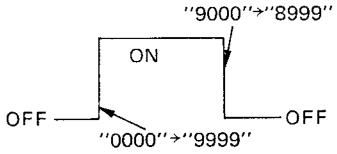
Switch		Time when activated	Function
No.	Name		
S1	12 V control (12 V CTL)	PLAY, FF, REW key depressed	Switch for timer recording
S2	Play	PLAY key depressed	Supplies play 12 V to mechanism control board
S3	REW	REW key depressed	Supplies rewind 12 V to mechanism control board
S4	Operation	PLAY, FF, REW key depressed	Supplies operation 12 V to mechanism control board
S5	Pause	PAUSE key depressed	Supplies pause 12 V to mechanism control board
SW1	Channel lock	–	Locks channel selector (except when program timer is operating)
SW2	–	–	–
SW3	Unloading-1 (UL-1)	On when loading arm operates, remains on until loading arm returns to cassette	Supplies UL 12 V to mechanism control board
SW4	Unloading-2 (UL-2)	Same as UL-1	Releases 12 V when timer recording stops
SW5	After loading-1 (AL-1)	Completion of loading	Supplies AL 12 V to mechanism control board
SW6	After loading-2 (AL-2)	Completion of loading	Supplies AL 12 V to AUDIO board
SW7	Cassette switch	Cassette housing lowered	Detects normal lower position of cassette housing
SW8	Search switch	2 position selector switch: counter search and cue search	Supplies search 12 V to mechanism control board
SW9	Full recording-1 (FR-1)	REC key depressed	Supplies FR 12 V (1) to AUDIO board
SW10	Full recording-2 (FR-2)	REC key depressed	Supplies FR 12 V (2) to AUDIO board
SW11	Full recording/after recording-1 (FR/AR-1)	REC or AUDIO DUB key depressed	Supplies FR/AR 12 V (1) to AUDIO board
SW12	Full recording/after recording-2 (FR/AR-2)	REC or AUDIO DUB key depressed	Supplies FR/AR 12 V (2) to AUDIO board
SW13	Recording select	–	Selects between AUX signal and TV signal
SW14	Counter	On when counter indication changes from 0000 to 9999 	When SEARCH switch (SW8) is set to COUNTER, search signal is sent to mechanism control board.
S13	AFT	On when pre-tuning control cover is closed.	Switch for automatic fine tuning of the tuner

Table 2-1

4. After completion of loading in the Play or REC mode, if the FUNCTION switch is set to STAND BY, then returned to on, the pause solenoid becomes on about 3 seconds later.

2.6.3 DC motor control

The DC motor is controlled in the following conditions.

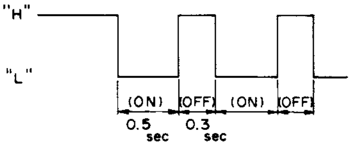
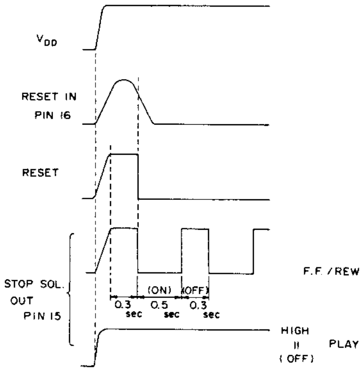
1. The motor rotates during Play, FF and REW modes when operation switch (S4) is on.
2. When the Stop mode is set while the Play (REC) mode is in progress, the motor rotates after the unloading arm returns and SW3 (Unloading-1) opens.
3. The motor does not rotate when the stop solenoid is energized.

2.6.4 Switch layout and functions

See Fig. 2-19 and Table 2-1.

2.6.5 IC1 inputs and outputs

Nearly all of the mechanism control circuit is contained within IC1 (MSM5830RS). Table 2-2 lists the input and output signals of this IC.

Pin No.	Input/output signal	Signal type	Operation
1	Operate in	11 V	High from operation switch (S4) during PLAY, FF and REW modes
2	REW in	11 V	High from REW switch (S3) during REW mode
3	Play in	10 V	High from PLAY switch (S2) during Play or REC mode
4	Timing pause in	11 V	Timing pause signal (high) from timing phase board
5	Pause out	–	Play mode Play: 0 V Still button: 0 V Remote still: 0 V REC mode Record: 0 V Pause button: 8 V Remote pause: 8 V
6	Motor control out	11 V	High output for motor rotation when UL-1 switch (SW3) is on.
7	Flip-flop in	30 Hz 6 Vp-p	Input for 30 Hz squarewave from drum flip-flop; requires level above 6 Vp-p.
8	Record in	10 V	High from AUDIO board for detecting REC mode
9	Pause in	10 V	High from PAUSE switch (S5) during Pause mode
10	Pause solenoid out	–	Play mode Play: 12 V Still button: 0 V Remote still: 12 V REC mode Record: 12 V Pause button: 0 V Remote pause: 0 V
11	Pause control in	12 V	Detects high input during Stop and Remote Pause modes (low during REC mode)
12	Tape guard in	9 V	Normally high; low when tape guard functions.
13	After loading in	10 V	Detects loading arm position; high from AL-1 (SW5) after loading completion
14	GND	0 V	Ground (earth) line
15	Stop solenoid out	–	Output for controlling stop solenoid operation; signal is negative logic as shown below.  "H" "L" (ON) (OFF) (ON) (OFF) 0.5 sec 0.3 sec
16	Reset in	–	Input for reset signal when power is set to on. Resets IC internal counter. In modes other than Play (i.e., FF and REW), stop solenoid is operated when power is switched on. See waveforms below.  V_{DD} RESET IN PIN 16 RESET STOP SOL. OUT PIN 15 (ON) (OFF) 0.3 sec 0.5 sec 0.3 sec F.F /REW HIGH II (OFF) PLAY

Pin No.	Input/output signal	Signal type	Operation
17	End sensor in	10 V	High input when photo sensor detects light at transparent end of tape. Stop solenoid operates.
18	Start sensor in	10 V	High when photo sensor detects light at transparent beginning of tape. Stop solenoid operates.
19	Unloading in	11 V	High from UL-1 (SW3)
20	Take-up sensor in	(1 Hz, 3.5 Vp-p)	Not used in this model; connected to 12 V line
21	Search in	12 V	In REW mode, high when counter changes from 0000 to 9999. Requires more than 50 msec pulse width.
22 23 24	OSC 3 OSC 2 OSC 1	–	Reference signal generator circuit; frequency approx. 16.5 kHz; used for internal timer reference signal
25	REC select in	(12 V)	Input for detecting the Recording mode; not used with this model; connected to 12 V line
26	REC lamp out	(10 V)	REC lamp drive signal output; not used with this model
27	Stop select in	0 V	Input for setting pause timer; pause release time is determined by the voltage applied to this input. See below. Input DC : Pause release time 0 V : 7 minutes 6 V : 14 minutes 12 V : 28 minutes
28	V_{DD}	12 V	Power supply terminal

Table 2-2

2.7 TIMING PHASE CIRCUIT

This circuit is included in order to improve performance during intermittant recording. In the simple editing system of previous models, since neither electrical nor mechanical control was provided, servo loss at the editing point caused picture disturbance during playback. The problem is reduced considerably in this model by incorporating the following improvements.

First is mechanical adjustment of the space between the capstan and pinch roller to 0.4 mm, together with provisions for maintaining this value.

The second improvement is the inclusion of the timing phase circuit to control the stopping and starting of the tape. As can be noted from the timing chart in Fig. 2-20, the phase between the control signal and drum flip-flop is maintained at a fixed value.

By using the phase of the rising component of the drum flip-flop, the tape stopping and timing phases become nearly the same from the viewpoint of the control signal. In other words, R9 (STOP TIMING) and R10 (START TIMING) of the TIMING PHASE board are adjusted for the same parameters with reference to the drum flip-flop phase.

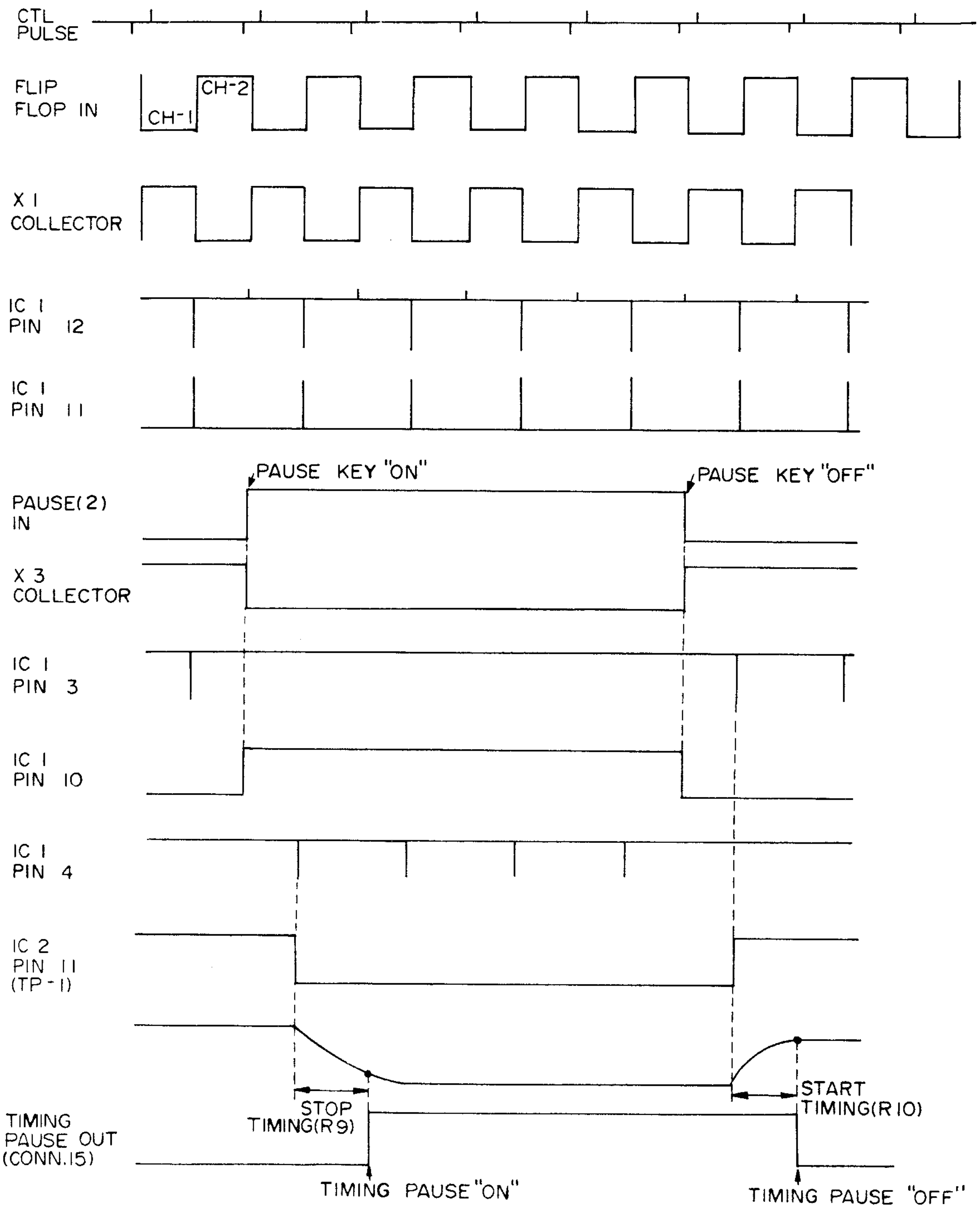

CTL
PULSE
FLIP
FLOP IN
CH-1
CH-2
X 1
COLLECTOR
IC 1
PIN 12
IC 1
PIN 11
PAUSE KEY "ON"
PAUSE KEY "OFF"
PAUSE(2)
IN
X 3
COLLECTOR
IC 1
PIN 3
IC 1
PIN 10
IC 1
PIN 4
IC 2
PIN 11
(TP-1)
STOP
TIMING(R9)
START
TIMING(R10)
TIMING
PAUSE OUT
(CONN.15)
TIMING PAUSE "ON"
TIMING PAUSE "OFF"

Fig. 2-20 Timing phase circuit

2.8 PROGRAM TIMER CIRCUIT

2.8.1 Outline

The program timer of this model functions around a 4 bit microcomputer contained in a CMOS LSI (complementary metal oxide silicon, large scale integrated circuit) device. Up to six programs can be entered, each consisting of program day, channel, start time and program length.

Timer outputs include recording start (REC OUT) and prestart. The prestart output is produced ten seconds prior to the programmed recording start time.

In event of a commercial power failure, a backup circuit maintains normal timer operation for about 10 to 30 minutes. Block diagram of the program timer is shown in Fig. 2-21.

Power supply for the timer is taken from a DC to DC converter composed of X1, X2, T1, D1, D2 and D4 to D6. Input is DC 22 V from the regulator (REG) board; outputs are DC +5 V, DC −34 V and AC 3.1 V.

When the main power source is switched on, a reset pulse from IC2 pin 4 resets IC1. T2 functions as the internal 400 kHz clock oscillator for IC1 and is connected between pins 1 and 42. The timer clock is based on 4.194304 MHz produced by IC3, X7 and a crystal element. This frequency is divided $1/2^{22}$ to become a 1 Hz clock pulse.

Time adjustment and program data setting are performed by inputs from the display unit keys to pins 33 to 40 of the LSI. Ten seconds before the timer set time, the prestart output goes high, while buffer X5 collector remains low. This low goes to the REG board, power is supplied and recording begins. At this time, data relating to the channel are sent from IC1 to IC4.

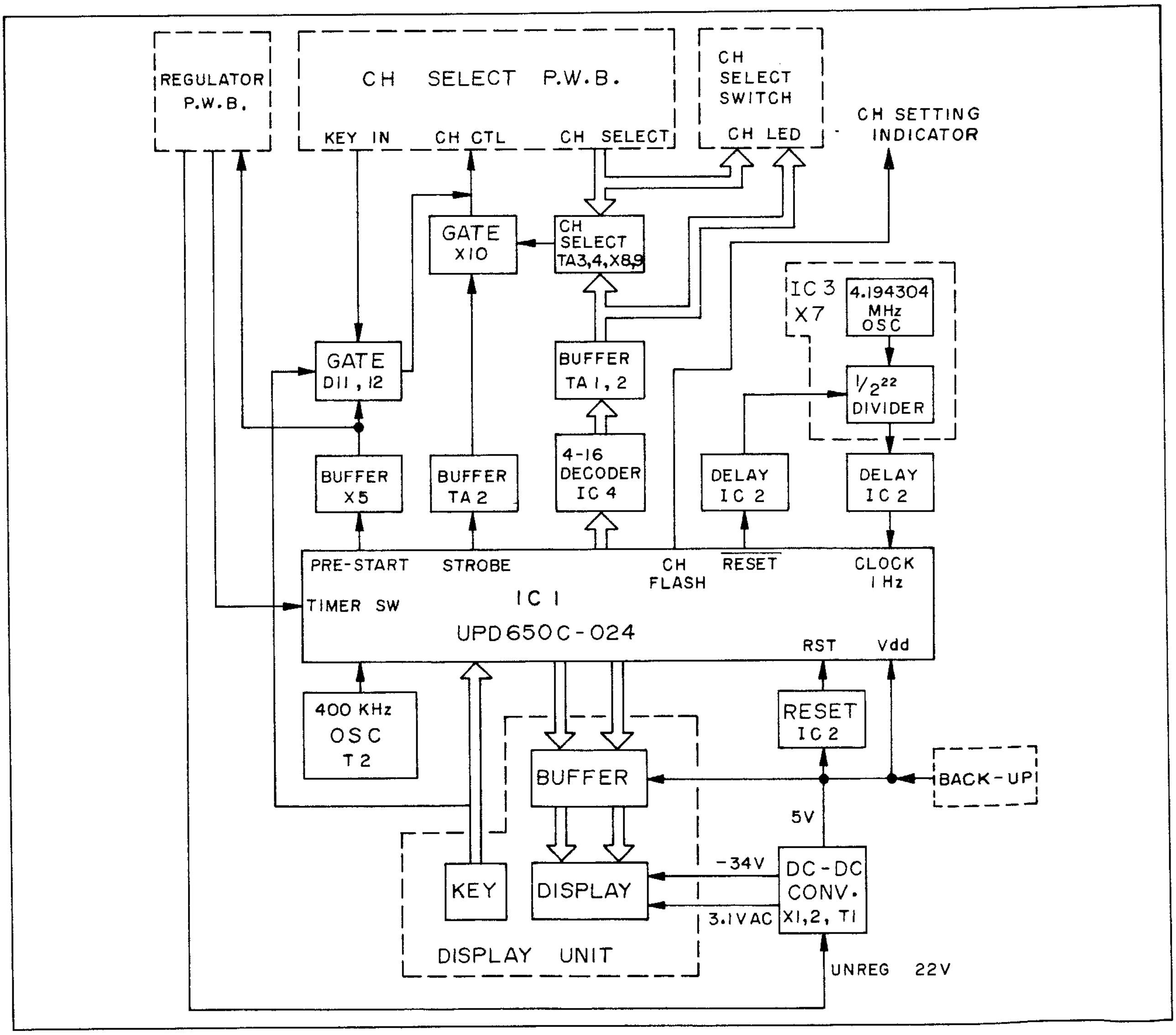

REGULATOR P.W.B.
CH SELECT P.W.B.
KEY IN
CH CTL
CH SELECT
CH SELECT SWITCH
CH LED
CH SETTING INDICATOR
GATE X10
CH SELECT TA3,4,X8,9
IC 3 X7
4.194304 MHz OSC
GATE D11, 12
BUFFER TA 1, 2
1/2²² DIVIDER
4-16 DECODER IC 4
BUFFER X5
BUFFER TA 2
DELAY IC 2
DELAY IC 2
PRE-START
STROBE
CH FLASH
RESET
CLOCK 1 Hz
TIMER SW
IC 1
UPD650C-024
RST
Vdd
400 KHz OSC T2
RESET IC 2
BUFFER
BACK-UP
5V
-34V
DC-DC CONV. X1,2, T1
KEY
DISPLAY
3.1VAC
DISPLAY UNIT
UNREG 22V

Fig. 2-21 Program timer block diagram

IC4 is a 4—16 line decoder with a 4 bit latch. Inputs are 4 bit data, strobe and inhibit and decoder ouputs are S_0 to S_{15}. Since this timer does not use the latch operation, the strobe input is fixed at high potential. S_1 to S_{12} are adjusted to the TV channels and when the A, B, C, D 4 bit binary signal from IC1 is decoded, high level output appears at S_1 to S_{12} according to the input signal.

The high level signal goes through TA1 (transistor array) or TA2 buffer to light the front panel channel indicator. At the same time, the signal is applied to the channel select circuit, which in place of manual selection, electrically switches to the programmed channel. The output of the channel select circuit and the strobe pulse from IC1 are gated at X10 and the resulting signal goes to the CHANNEL SELECT board.

2.8.2 4 bit microcomputer (μPD650C-024)

The main component of the program timer is the built-in microcomputer. Block diagram and pinouts are shown in Figs. 2-22 and 2-23.

An explanation of the IC is given by the algorithm of Fig. 2-24. This algorithm is highly abbreviated and provided only for reference. For a detailed explanation on the principles of this type microcomputer, please consult appropriate texts on this subject.

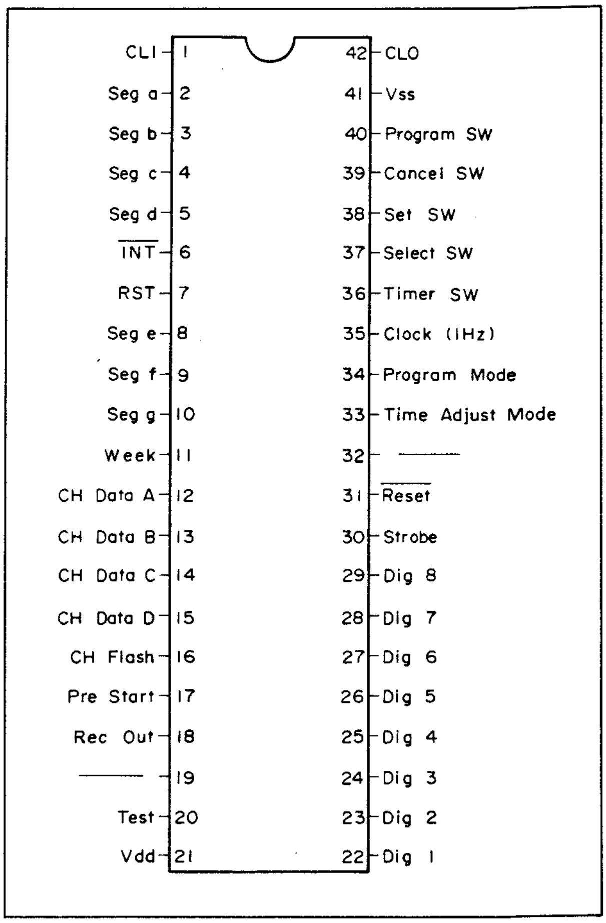

CLI 1
Seg a 2
Seg b 3
Seg c 4
Seg d 5
INT 6
RST 7
Seg e 8
Seg f 9
Seg g 10
Week 11
CH Data A 12
CH Data B 13
CH Data C 14
CH Data D 15
CH Flash 16
Pre Start 17
Rec Out 18
——— 19
Test 20
Vdd 21
42 CLO
41 Vss
40 Program SW
39 Cancel SW
38 Set SW
37 Select SW
36 Timer SW
35 Clock (1Hz)
34 Program Mode
33 Time Adjust Mode
32 ———
31 Reset
30 Strobe
29 Dig 8
28 Dig 7
27 Dig 6
26 Dig 5
25 Dig 4
24 Dig 3
23 Dig 2
22 Dig 1

Fig. 2-23

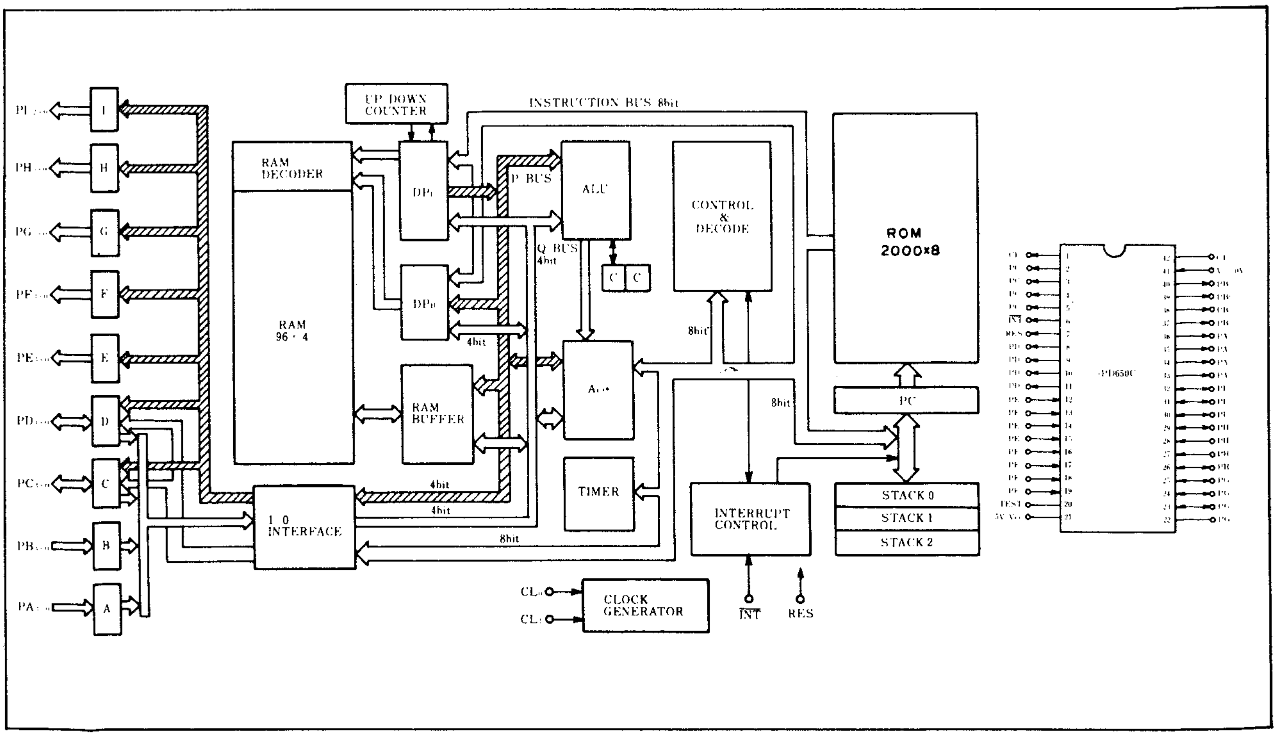

PI
PH
PG
PF
PE
PD
PC
PB
PA
I
H
G
F
E
D
C
B
A
UP DOWN COUNTER
INSTRUCTION BUS 8bit
RAM DECODER
RAM 96 × 4
DP_L
DP_H
P BUS
ALU
Q BUS 4bit
C C
ACC
RAM BUFFER
4bit
4bit
4bit
8bit
8bit
8bit
CONTROL & DECODE
ROM 2000×8
PC
STACK 0
STACK 1
STACK 2
I/O INTERFACE
TIMER
INTERRUPT CONTROL
CLOCK GENERATOR
CL0
CL1
INT
RES
μPD650C

Fig. 2-22

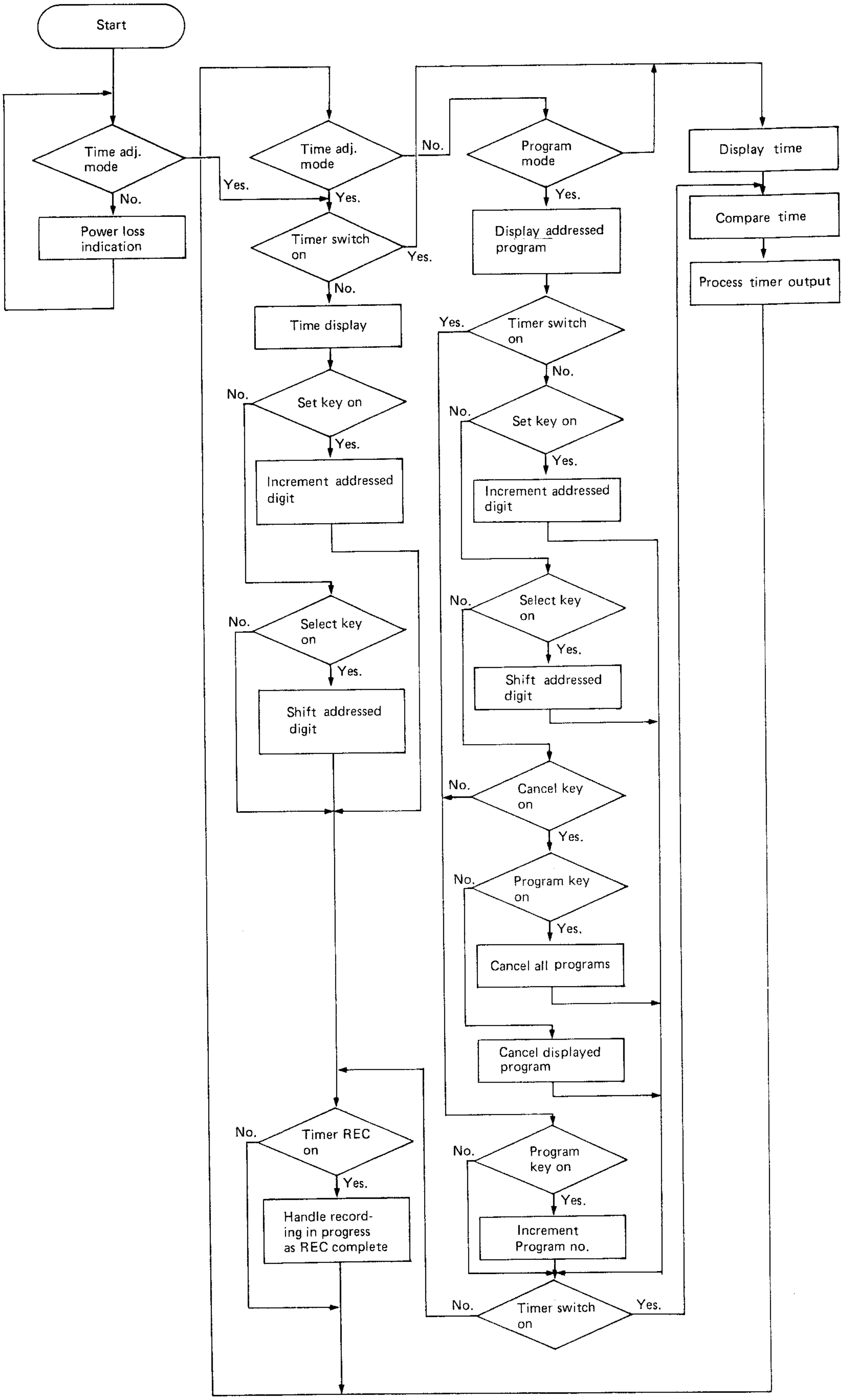

Start
Time adj. mode
No.
Power loss indication
Yes.
Time adj. mode
No.
Yes.
Timer switch on
Yes.
No.
Time display
Set key on
No.
Yes.
Increment addressed digit
Select key on
No.
Yes.
Shift addressed digit
Timer REC on
No.
Yes.
Handle recording in progress as REC complete
Program mode
Yes.
Display addressed program
Timer switch on
Yes.
No.
Set key on
No.
Yes.
Increment addressed digit
Select key on
No.
Yes.
Shift addressed digit
Cancel key on
No.
Yes.
Program key on
No.
Yes.
Cancel all programs
Cancel displayed program
Program key on
No.
Yes.
Increment Program no.
Timer switch on
No.
Yes.
Display time
Compare time
Process timer output

Fig. 2-24 Abbreviated algorithm

2.8.3 Reset pulse

The reset pulse is produced 1) when the main power is supplied and 2) when power returns after a commercial power interruption (which exceeds the backup circuit capability). At this time, a positive pulse from IC2 pin 4 goes to IC1 pin 7. IC2 is a Schmitt trigger and when a voltage greater than V_{T+} (see Fig. 2-25) appears at its input, the output becomes low potential. Conversely, the output goes high when the input voltage declines to V_{T-}.

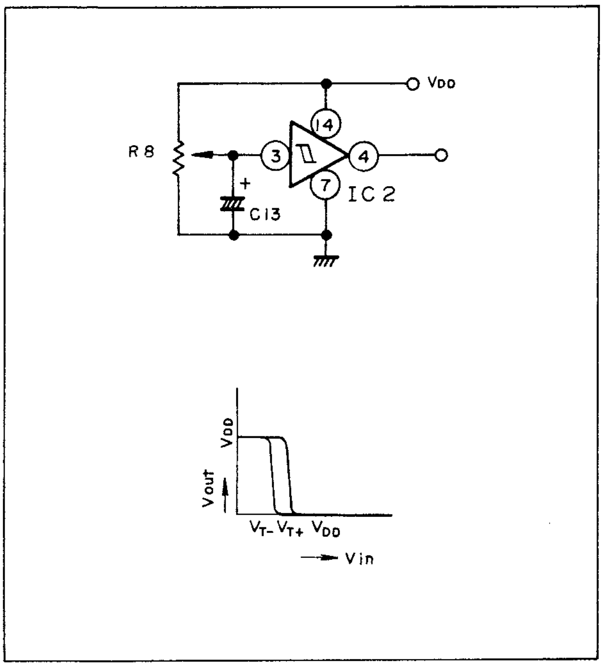


Fig. 2-25

1. Main power on
   When the main power is supplied, DC 5 V is applied to IC2 as V_{DD}. However, until the potential of C13 connected at IC2 pin 3 input exceeds V_{T+}, the pin 4 output stays high. After V_{T+} is exceeded, the output drops low and becomes the reset pulse applied to IC1 pin 7. This corresponds to To in Fig. 2-26.

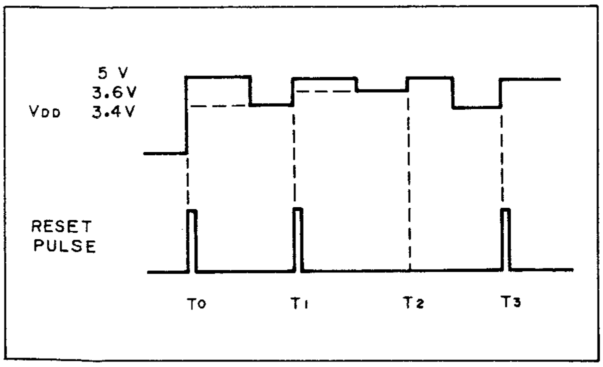


Fig. 2-26

2. Power failure indication
   In event of commercial power loss, IC1 continues to operate normally for about 10 to 30 minutes (according to the amount of time power was supplied prior to the loss) from the backup circuit. If the power does not return within this time, there is risk of misoperation when V_{DD} declines below DC 3.4 V. In this event, when power returns and V_{DD} again reaches DC 5 V, the reset pulse is produced and the power failure indication (flashing SUN 88 88 00) provided. This corresponds to T1 and T3 in Fig. 2-26.

   The relationship between V_{DD} and V_T is proportional. When V_{DD} is DC 3.4 V, V_{T-} potential becomes additionally lower and IC2 pin 4 output does not change. At this point, when DC 5 V returns, C13 holds pin 3 input at DC 3.4 V. The positive reset pulse is then obtained until C13 charge exceeds V_{T+}.

2.8.4 Delay monostable

The $\overline{\text{RESET}}$ pulse from IC1 pin 31 is increased to approx. 0.5 sec by the monostable of IC2 and sets the reset terminal (pin 3) of IC3 low.

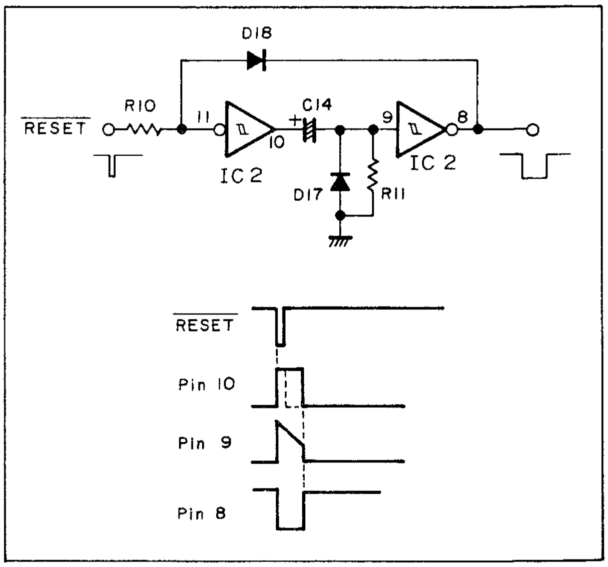


Fig. 2-27

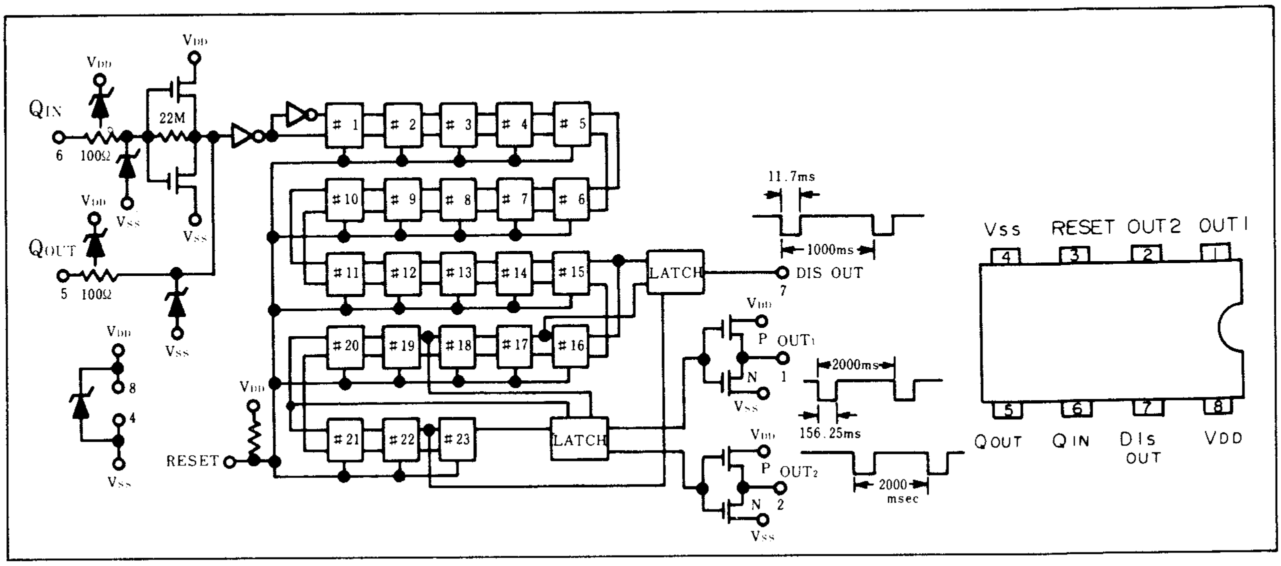
As outlined in Fig. 2-27, the negative polarity pulse from IC1 pin 31 goes via R10 to IC2 pin 11. Pin 10 of IC2 then goes high. The high level is applied to pin 9 through C14 and pin 8 drops low. Consequently, D18 switches on and holds pin 11 low.

Since IC2 is a Schmitt trigger, its hysteresis properties introduce a slight delay in the rise and fall of the waveform, and even when the input pulse ceases, pin 11 becomes held low by D18. Consequently, C14 and R11 hold pin 8 low until pin 9 potential declines below the threshold level.

2.8.5 Clock pulse (1 Hz) generator

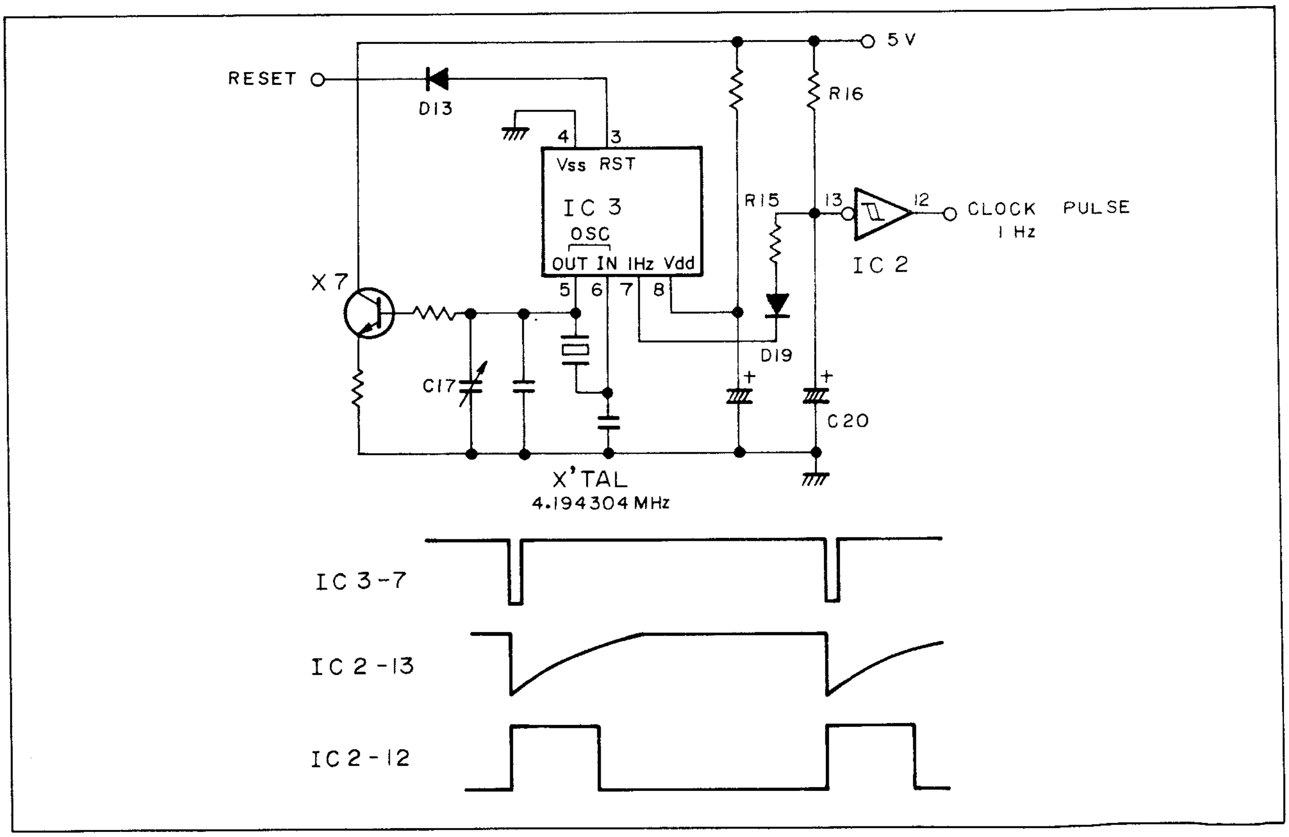
The reference 1 Hz clock pulse for the timer is obtained from a circuit consisting of IC3, X7, a crystal oscillator and IC2. Fig. 2-28 shows the block diagram of IC3.

The 4.194304 MHz crystal and X7 are connected between pins 5 and 6 of IC3 (Fig. 2-29). Within IC3, the oscillation frequency is divided $1/2^{22}$ and appears as a 1 Hz negative pulse at IC3 pin 7. This is converted to a wide clock pulse by the Schmitt trigger of D19, R15, R16, C20, and pins 12 and 13 of IC2.



V_{DD}
Q_{IN}
6 100Ω
22M
V_{SS}
Q_{OUT}
5 100Ω
8
4
RESET
#1 #2 #3 #4 #5
#10 #9 #8 #7 #6
#11 #12 #13 #14 #15
#20 #19 #18 #17 #16
#21 #22 #23
LATCH
LATCH
11.7ms
1000ms
DIS OUT
7
P OUT₁
N 1
2000ms
156.25ms
P OUT₂
N 2
2000 msec
Vss RESET OUT2 OUT1
4 3 2 1
5 6 7 8
QOUT QIN DIS OUT VDD

Fig. 2-28 SM5502A



RESET
D13
5 V
R16
4 3
Vss RST
IC 3
OSC
OUT IN 1Hz Vdd
5 6 7 8
X7
C17
R15
13
12
CLOCK PULSE 1 Hz
IC 2
D19
C20
X'TAL 4.194304 MHz
IC 3-7
IC 2-13
IC 2-12

Fig. 2-29 1 Hz clock pulse

2.8.6 4 bit 44-16 line decoder

IC4 (MSM4514) is a latching 4 bit 4-16 line decoder. It consists of 4 bit data inputs (A, B, C, D), strobe input, inhibit input and decoder outputs (S_0 to S_{15}). Signal outputs S_1 to S_{12} select TV channels 2 to 13 (locally vacant VHF channel positions can be pretuned by the user to receive UHF channels). Since the latch function is not employed, the strobe input is fixed at high level.

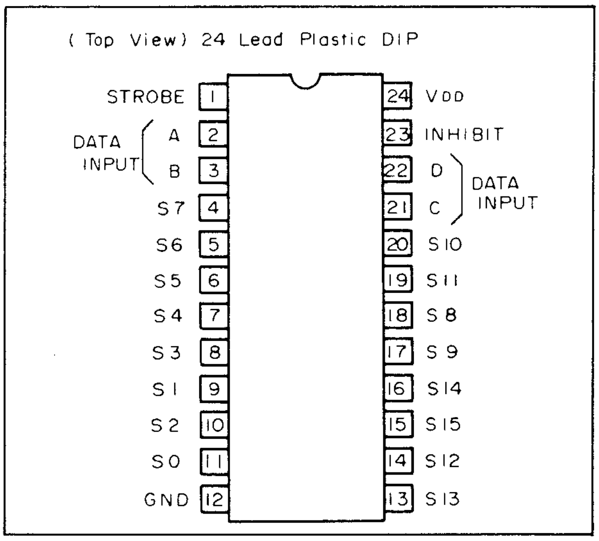


Fig. 2-30 MSM4514

Consequently, channel data inputs (A, B, C, D) from IC1 are decoded and S_1 to S_{12} high outputs produced according to the input data. Pinouts and functions for IC4 are shown in Fig. 2-30 and Table 2-3.

2.8.7 Channel select and gate circuits

According to the channel data from IC4, the circuit composed of TA3, TA4, X8, X9, X10, and D20 to D58 produces the channel control (CH CTL) signal sent from terminal 45 to the CHANNEL SELECT board. In place of manually pressing the channel selector buttons, the desired channel becomes selected electrically. As an example, selection of channel 2 is described below.

When channel 2 is instructed, high from IC4 pin 9 goes to TA1 pin 7. TA1 (and also TA2) is an open collector transistor array and its load resistance is resistor array RA3. With high at TA1 pin 7, pin 10 is low. The low at TA3 switches its transistors on (TA3 is a common collector transistor array). High (32 V) from terminal 11 goes through D44, TA3 transistors and D58 to X10 emitter. X10 is a gate circuit and becomes on with a high emitter and low base. High is normally present at X10 base, but when the positive strobe pulse from IC1 pin 20 appears at TA2 pin 2 (PRESTART or REC OUT), X10 base drops low. This allows the high

(STROBE="H")

INHIBIT	DATA INPUT				SELECTED OUTPUT															
	A	B	C	D	S_0	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}	S_{15}
L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	L	H	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L
L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L
L	L	H	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L
L	H	H	H	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L
L	L	L	L	H	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L
L	H	L	L	H	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L
L	L	H	L	H	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L
L	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L
L	L	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L
L	H	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L
L	L	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L
L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H
H	*	*	*	*	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L

* = Don't Care

Table 2-3 Function table

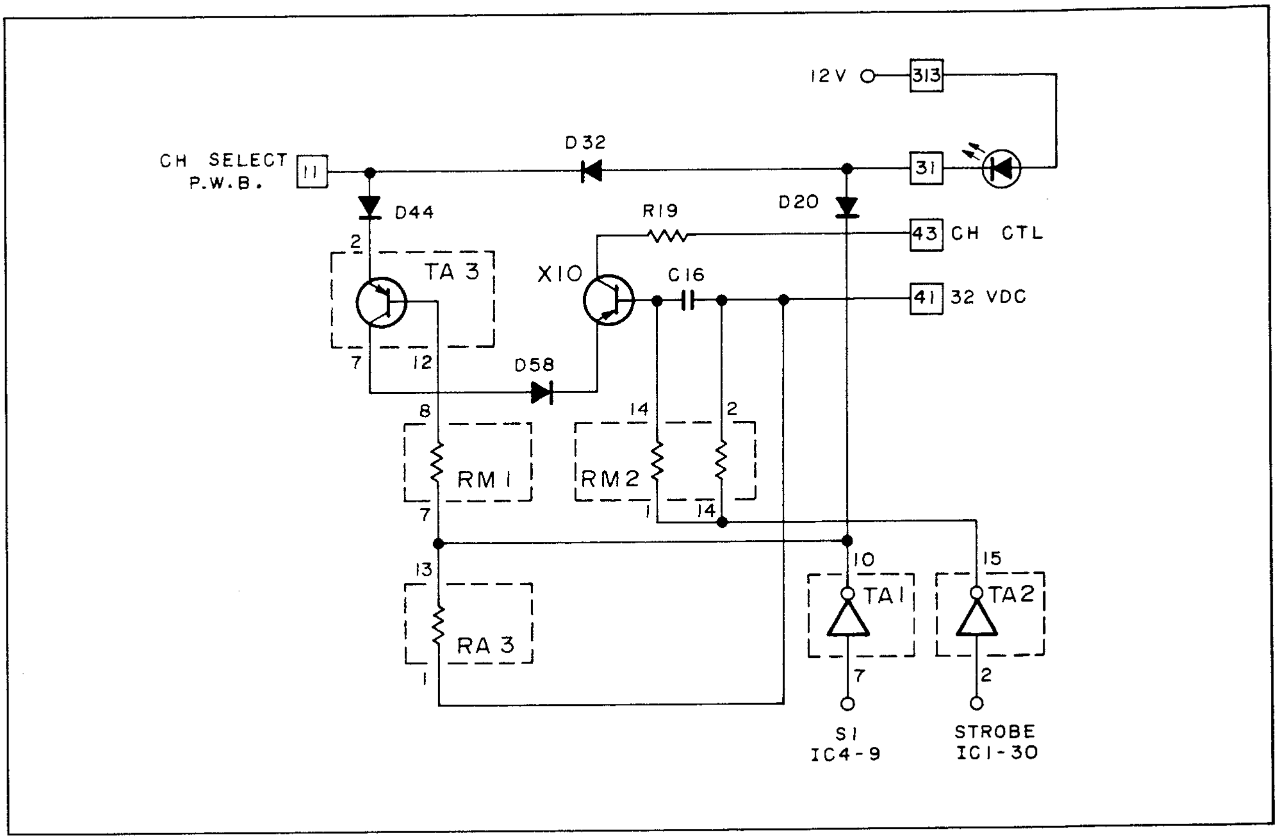

12V
313
CH SELECT P.W.B.
11
D32
31
D44
R19
D20
43
CH CTL
2
TA 3
X10
C16
41
32 VDC
7
12
D58
8
14
2
RM 1
RM 2
7
1
14
13
10
15
TA 1
TA 2
RA 3
1
7
2
S1
IC4-9
STROBE
IC1-30

Fig. 2-31 Channel select and gate circuits

channel control signal from terminal 11 to pass through X10, R19 and terminal 43 and go to the CHANNEL SELECT board.

With TA1 pin 10 low, D20 switches on and the channel indicator (in this case CH-2) lights. Refer to Fig. 2-31.

2.8.8 DC to DC converter

TIMER board power is DC 5 V produced by a DC-DC converter circuit composed of X1, X2, T1, D1, D2 and D4 to D6. Input is DC 22 V from the REG board. Other outputs are DC –34 V and AC 3.1 V for the display unit. Figs. 2-32 and 2-33 illustrate the circuit composition and principle.

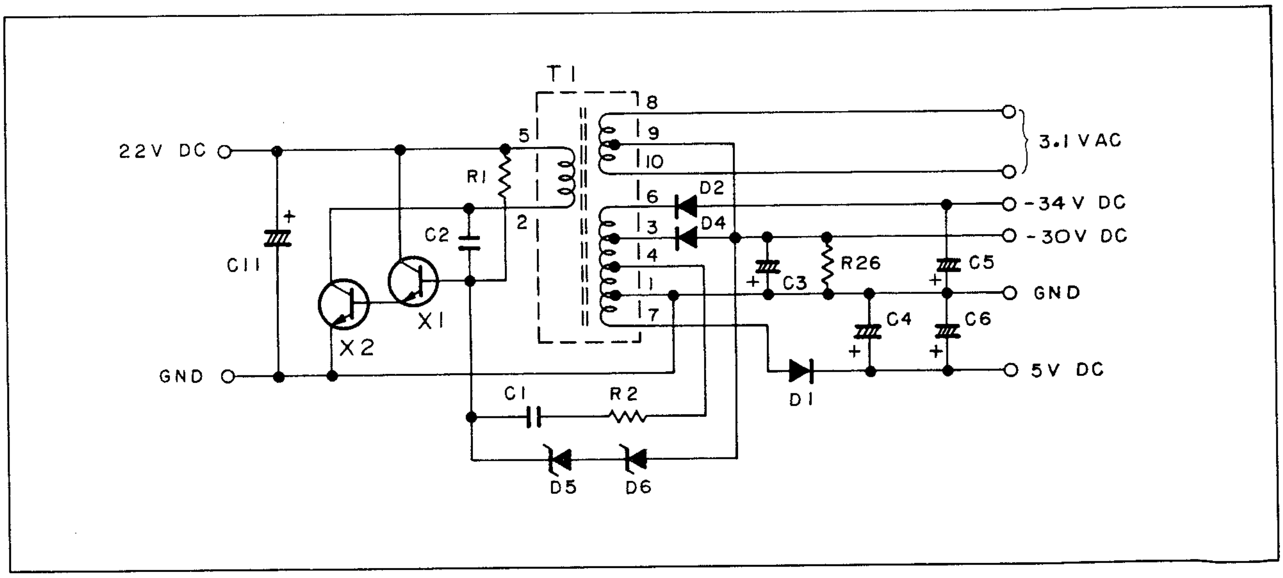

T1
8
9
10
3.1 VAC
22V DC
5
R1
6
D2
-34 V DC
C11
C2
2
3
D4
-30V DC
4
R26
C5
C3
1
GND
X1
7
C4
C6
X2
GND
D1
5V DC
C1
R2
D5
D6

Fig. 2-32 DC-DC converter

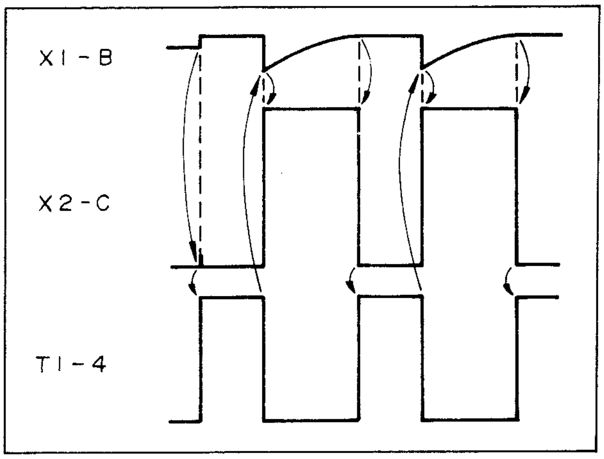


Fig. 2-33

With main power on and DC 22 V supplied, R1 biases X1 which becomes on and switches X2 on. This applies the DC 22 V between taps 2 and 5 of T1.

Although voltage becomes excited in T1 secondary coil, since the input is DC, the excitation voltage quickly ceases. This variation is returned from tap 4 to X1 base through R2 and C1. The differentiated falling waveform cuts off X1 (and consequently X2).

Afterwards, X1 base potential again rises, switching on X1 and X2. The same operation then repeats. The square-wave excited in T1 secondary coil is rectified to yield a DC voltage. When the voltage in the secondary coil changes, zener diodes D5 and D6 apply the change component to X1 base, thereby controlling the on period of X1 and stabilizing the output voltage.

2.8.9 12 V power supply

When the front panel FUNCTION switch is set to STAND BY or TIMER, DC 12 V becomes supplied to terminal 28. When setting the program or confirming the set program, this 12 V is applied to terminal 313 as power for the channel indicator.

When the display function select switch is set to CLOCK or CLOCK SET, 22 V through R3 switches X3 on, cutting off X4.

At the PROGRAM SET position, D7 becomes on and X3 off. Consequently, X4 functions as a regulated power supply and 12 V goes through D57 to terminal 313.
See Fig. 2-34.

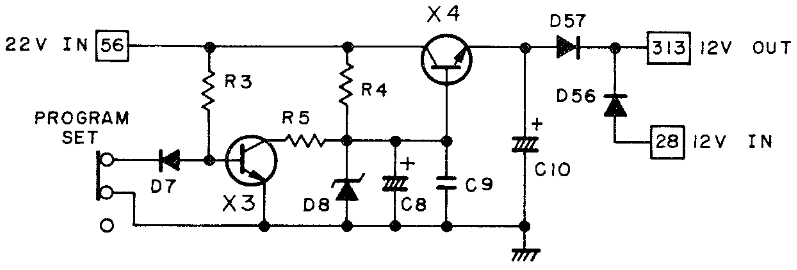


Fig. 2-34 12 V DC power supply

SECTION 3
DISASSEMBLY

3.1 CABINET REMOVAL

1. Take out 2 screws ① shown in Fig. 3-1, then slide the cover rearward to remove.

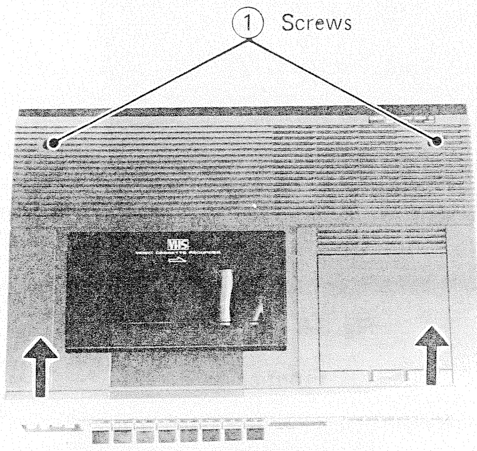


Fig. 3-1

2. Lift the left and right side covers upward to remove them as shown in Fig. 3-2.

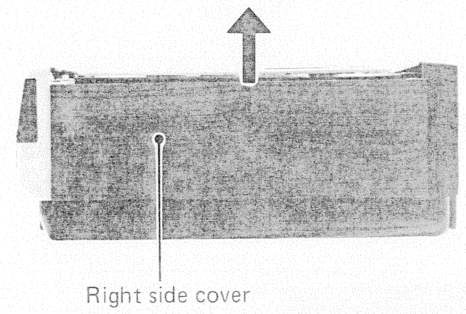

Right side cover

Fig. 3-2

3. Take out 6 screws ② shown in Fig. 3-3 and remove the rear cover.

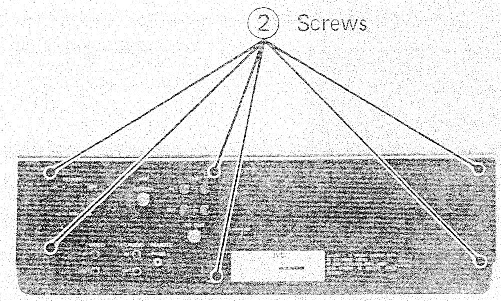


Fig. 3-3

4. Take out 6 screws ③ shown in Fig. 3-4 and remove the bottom cover.

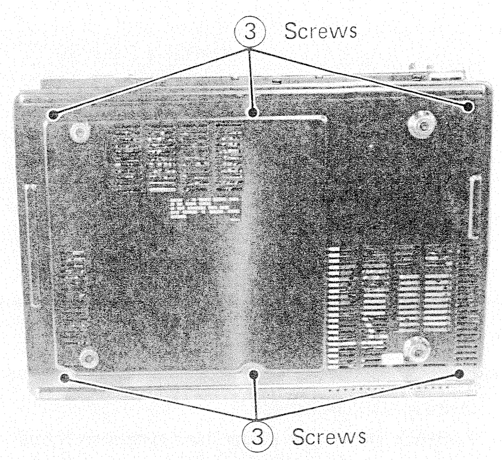

③ Screws
③ Screws

Fig. 3-4

5. To remove the front cover, first take out 2 screws ④ shown in Fig. 3-5, then take out 3 screws ⑤ shown in Fig. 3-6. Carefully pull the front cover forward. Disconnect the 4 DISPLAY board connectors ⑥ shown in Fig. 3-7.

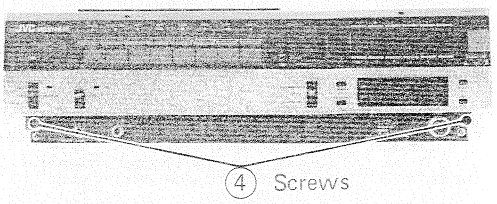


Fig. 3-5

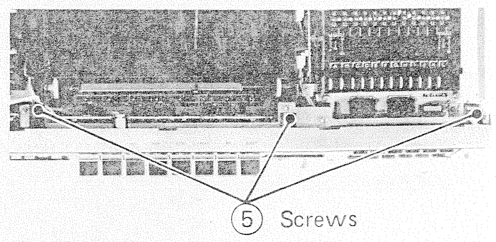


Fig. 3-6

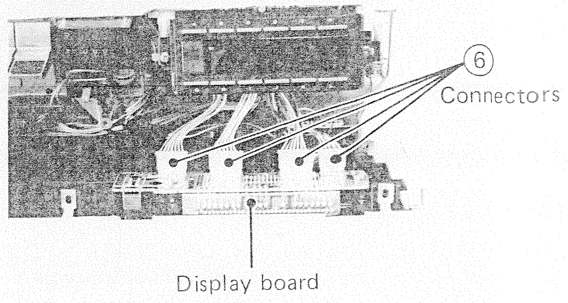

⑥
Connectors
Display board

Fig. 3-7

6. Take out 4 screws ⑦ shown in Fig. 3-8 and remove the cassette housing assembly. Use care not to damage or disengage the counter belt.

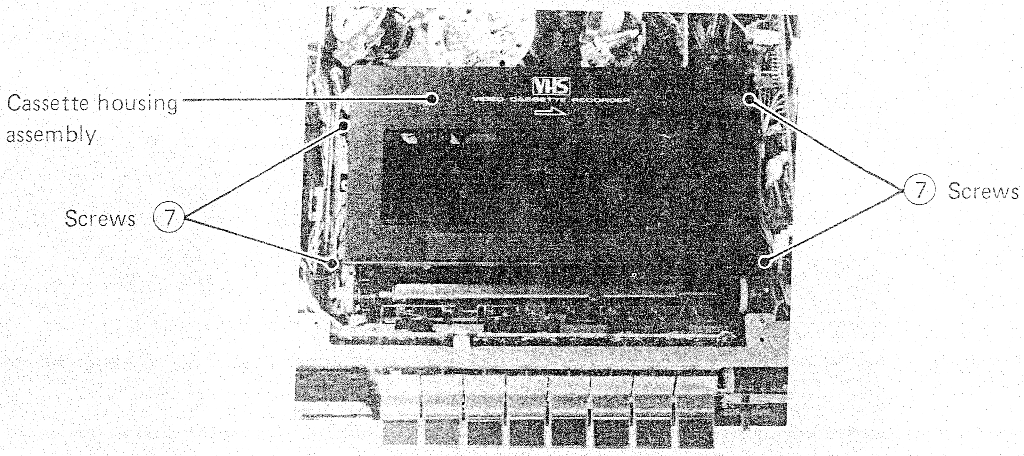

Cassette housing assembly
Screws ⑦
⑦ Screws

Fig. 3-8

7. Display unit removal
Remove the front cover (see previous steps). Take out 2 screw ⑧ shown in Fig. 3-9, then remove the display unit.

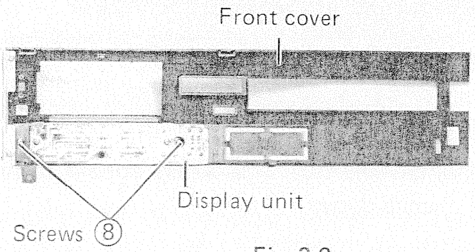

Front cover
Display unit
Screws ⑧

Fig. 3-9

3.2 PRINTED CIRCUIT BOARD REMOVAL

3.2.1 Layout of main printed circuit boards

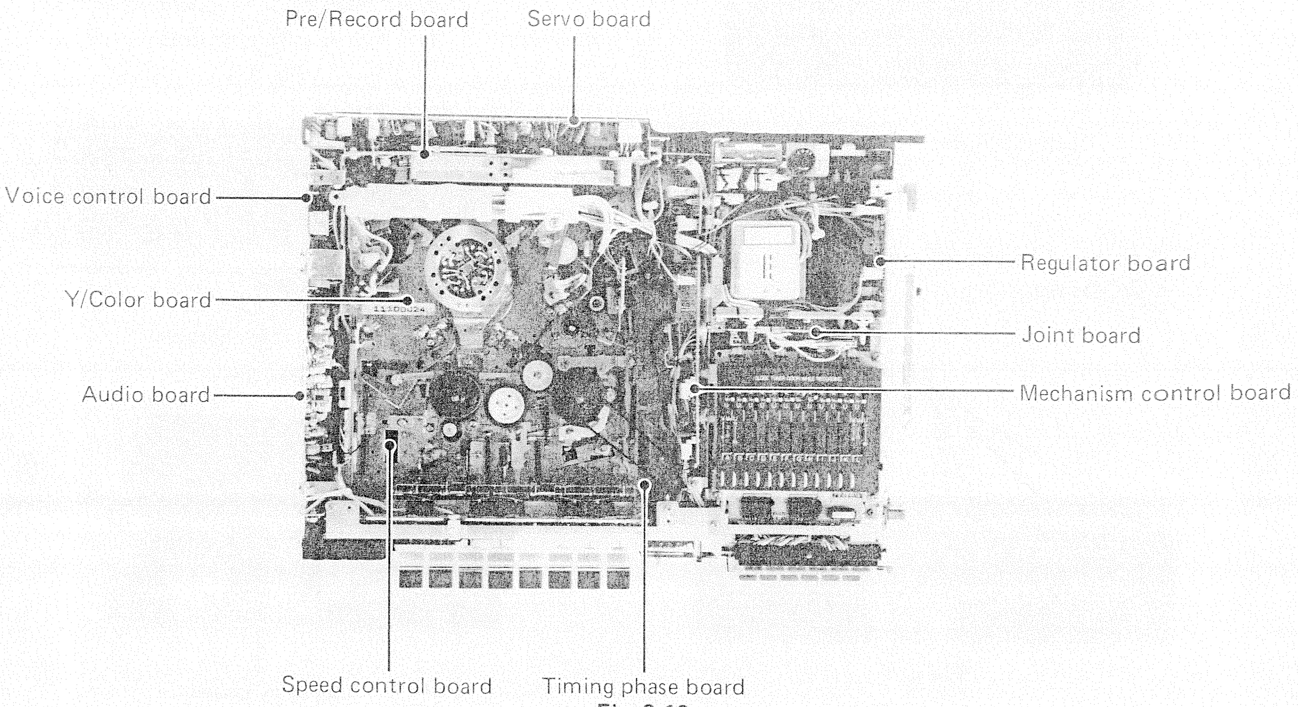

Pre/Record board
Servo board
Voice control board
Y/Color board
Audio board
Regulator board
Joint board
Mechanism control board
Speed control board
Timing phase board

Fig. 3-10

3.2.2 Audio and Voice Control boards

1. Take out 2 screws ① shown in Fig. 3-11. Disengage the REC lamp from the lamp bushing and remove the clamp (1 screw) securing the lamp wire (Fig. 3-12.)
2. Carefully disengage the AUDIO board from the board holders, disconnect the connector plugs, and remove the AUDIO board.
3. Take out 2 screws ② shown in Fig. 3-11. Disconnect the connector plugs, then carefully disengage the VOICE CONTROL board from the board holders and remove the board.

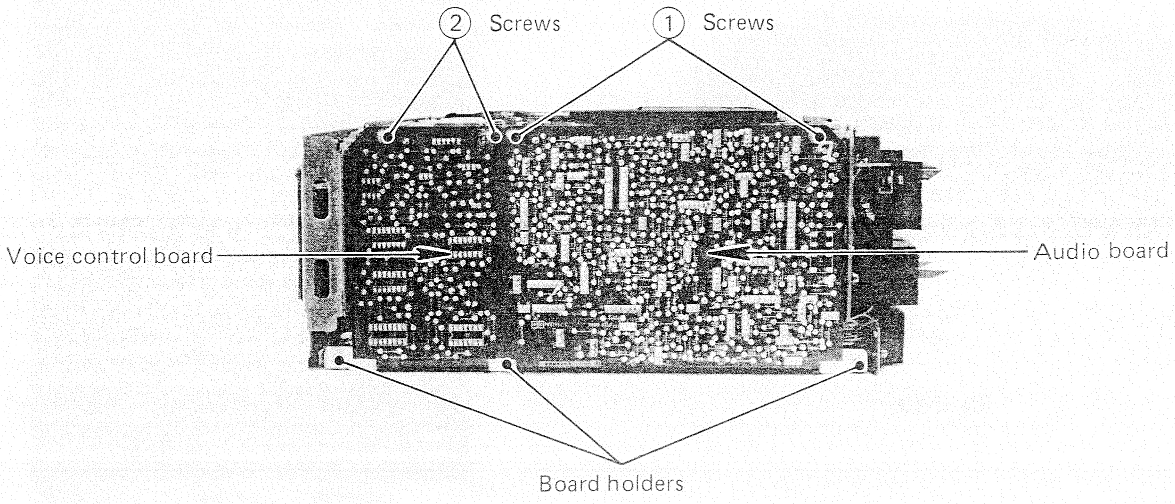

② Screws
① Screws
Voice control board
Audio board
Board holders

Fig. 3-11

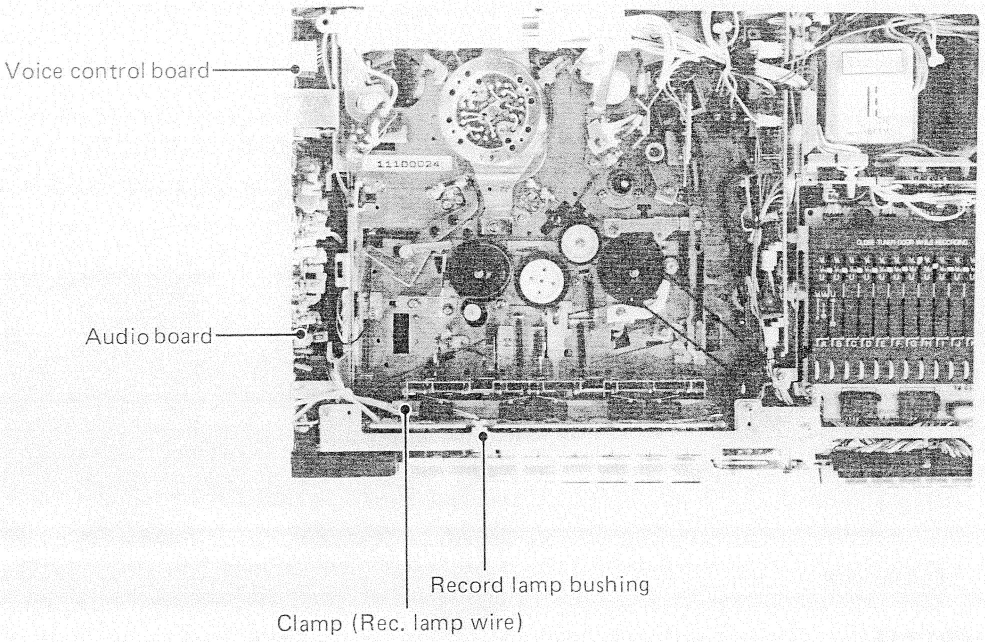

Voice control board
Audio board
Record lamp bushing
Clamp (Rec. lamp wire)

Fig. 3-12

3.2.3 Servo board

1. Take out 2 screws ③ shown in Fig. 3-13 and disconnect the connectors.
2. Take out 2 screws ④ shown in Fig. 3-13 and carefully disengage the SERVO board from the holders to remove.

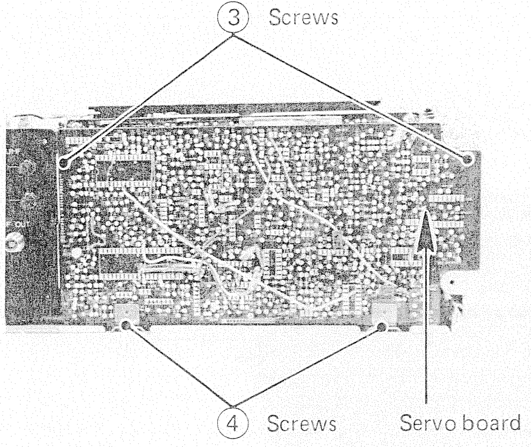


Fig. 3-13

3.2.4 Pre/Record board

1. Take out 4 screws ⑤ shown in Fig. 3-14.
2. Disconnect the connectors.
3. Carefully unsolder the shield cover and remove it, then unsolder the 2 lead wires connecting with the video heads and remove the PRE/REC board.

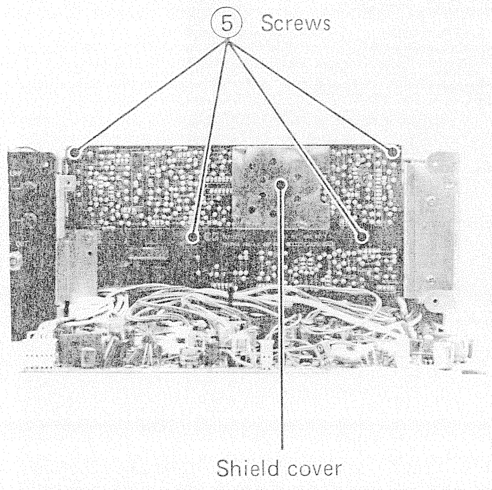


Fig. 3-14

3.2.5 Y & Color board

1. Take out 3 screws ⑥ shown in Fig. 3-15.
2. Disconnect the connectors.
3. Take out 2 screws ⑦ shown in Fig. 3-15 and remove the Y & COLOR board.

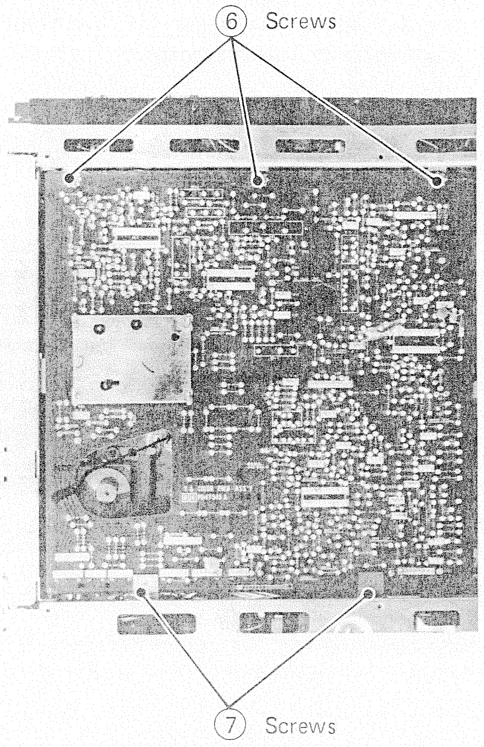


Fig. 3-15

3.2.6 Timing Phase board

1. Take out 2 screws ⑧ shown in Fig. 3-16.
2. Disconnect 2 connector plugs and remove the TIMING PHASE board.

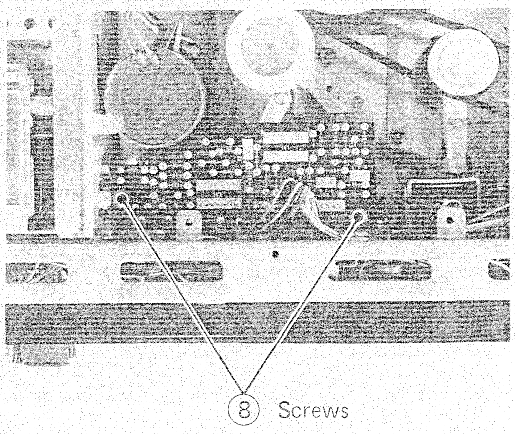


Fig. 3-16

3.2.7 Speed Control board

1. Take out 2 screws ⑨ shown in Fig. 3-17.
2. Disconnect the connector plugs and remove the SPEED CONTROL board.

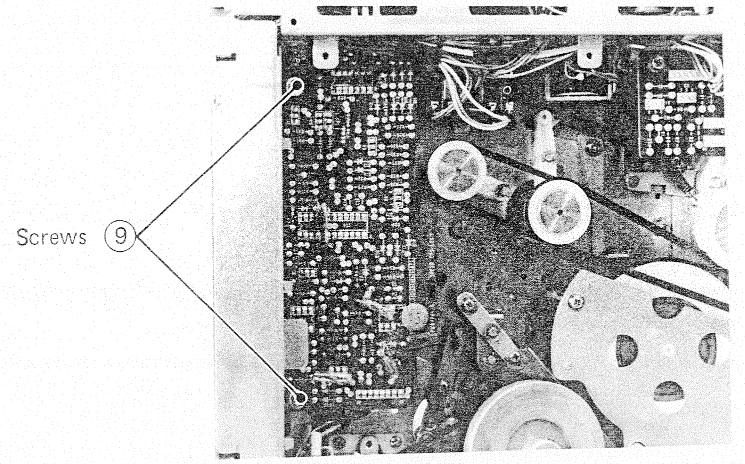


Fig. 3-17

3.2.8 Regulator board

1. Take out 2 screws ⑩ shown in Fig. 3-18.
2. Disconnect the 14 connector plugs from the Regulator board.
3. Carefully reise the board upwards to remove from chassis.
4. When reinstalling the board, observe that it is properly engaged with the lower stays (A in Fig. 3-18). Check this after reassembly.

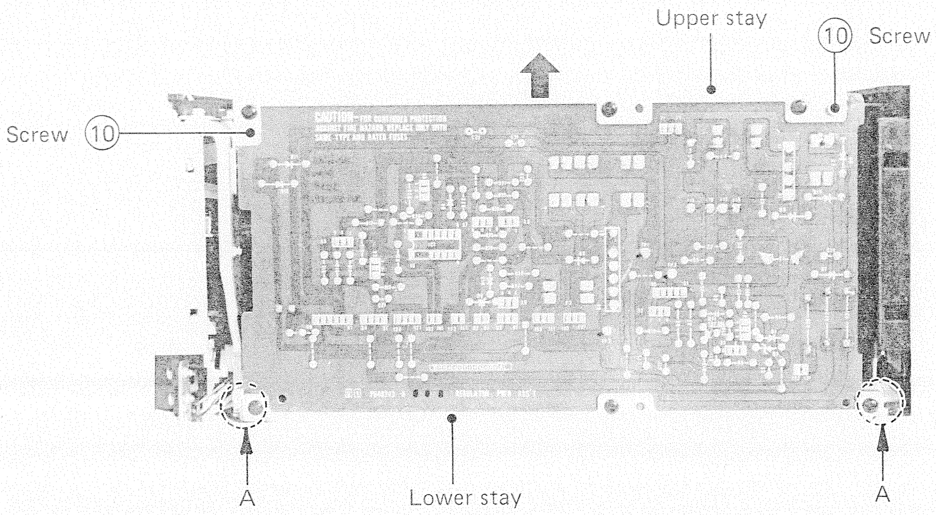


Fig. 3-18

SECTION 4
MECHANICAL ADJUSTMENTS

The adjustments described in this section are those which can be performed by a qualified service technician. Those which require highly specialized equipment and training (such as replacement of the lower drum) are omitted.

Proper maintenance and inspection are important both for ensuring top performance and preventing damage to the tape. Note that the required jigs must be employed when specified in the adjustment steps.

4.1 REQUIRED JIGS AND TOOLS

The jigs listed below are essential for performing mechanical adjustments. Attempts at adjustment without their use would involve tedious trial and error, and in many cases yield unsatisfactory results.

In addition to these, a set of metric hex keys (Allen wrenches) is required. The sizes needed for this model are 1.5 mm and 2 mm.

For cleaning and lubrication, alcohol, spindle oil, light grease, gauze, etc. are needed. Consult JVC for recommended locally available types.

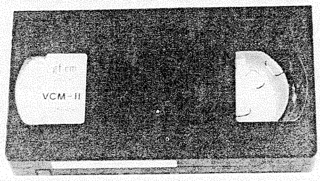
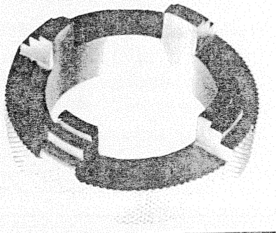
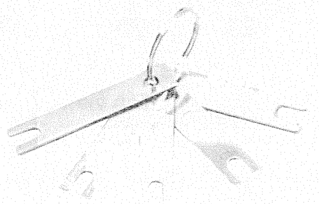
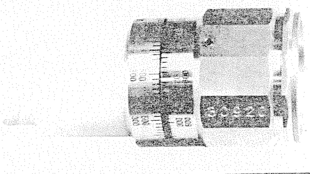
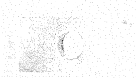
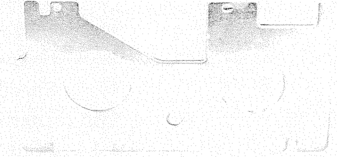
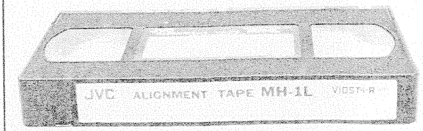
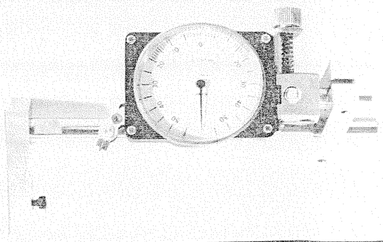
JVC Alignment Tape MH-1 	Back Tension Adjustment Jig PUJ48076 	F.G. Board Setting Jig PUJ48987-2 
Master Plane Jig PUJ35730 	Thickness Gauge PUJ48017 	*Torque Gauge Ass'y (600 gcm torque gauge and VHS adapter) PUJ48075 
Reel Disk Height Adjustment Jig PUJ48014 	Cassette Housing Setting Jig PUJ35881-2 	JVC Alignment Tape MH-1L 
Master Plane Position Jig PUJ48015 	JVC Oil PU41761 	Micro Checker PUJ49712 

Fig. 4-1 Jigs and tools

4.2 CLEANING AND LUBRICATION

4.2.1 Top view and parts identification

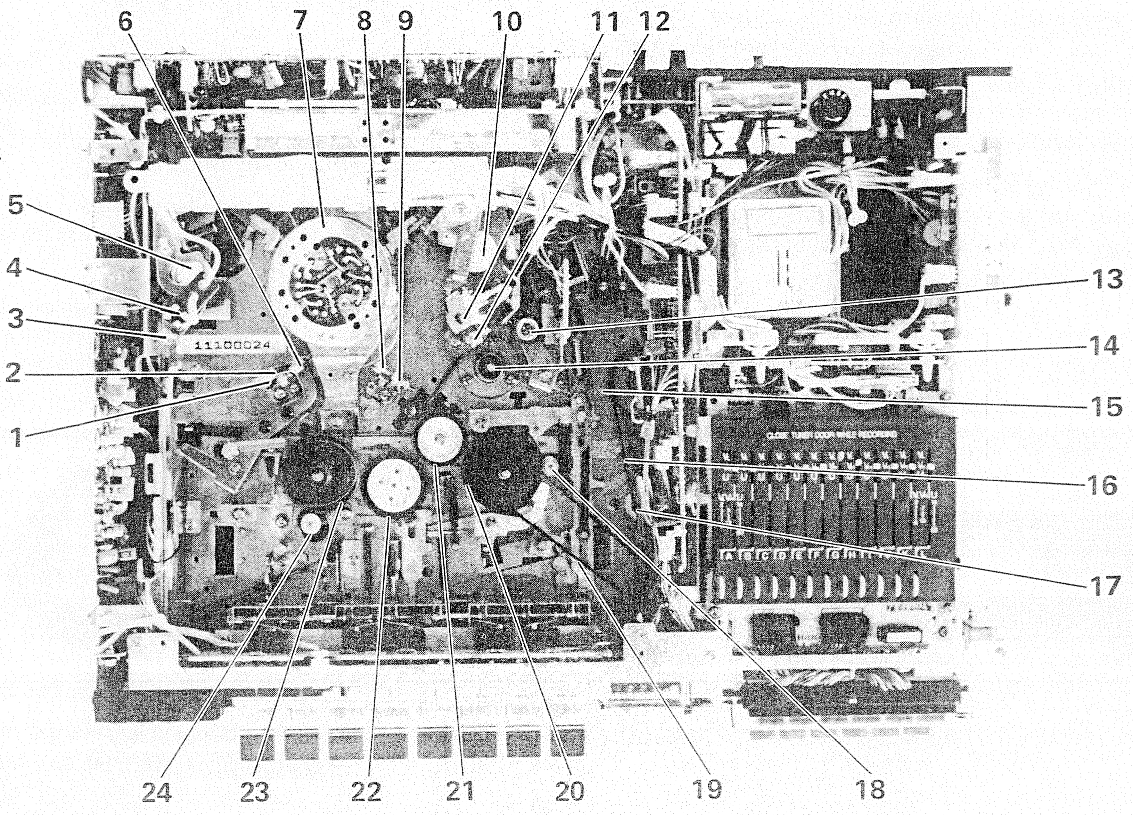


Fig. 4-2 Top view

1. Supply guide roller
2. Supply (slanted) pole
3. Supply guide pole
4. Full erase head
5. Supply impedance roller
6. Supply tension pole (Cue head)
7. Upper drum ass'y (Video heads)
8. Take-up (slanted) pole
9. Take-up guide roller
10. Take-up impedance roller
11. Audio/control head and audio erase head
12. Take-up guide pole
13. Pinch roller
14. Capstan shaft
15. Relay pulley (A)
16. Relay belt
17. Capstan motor pulley
18. Take-up idler side face
19. Counter belt (1)
20. Take-up reel disk side face (rubber tire)
21. F.F. pulley (rubber tire)
22. REW idler side face (rubber tire)
23. Supply reel disk side face
24. Unloading idler side face (rubber tire)

4.2.2 Bottom view and parts identification

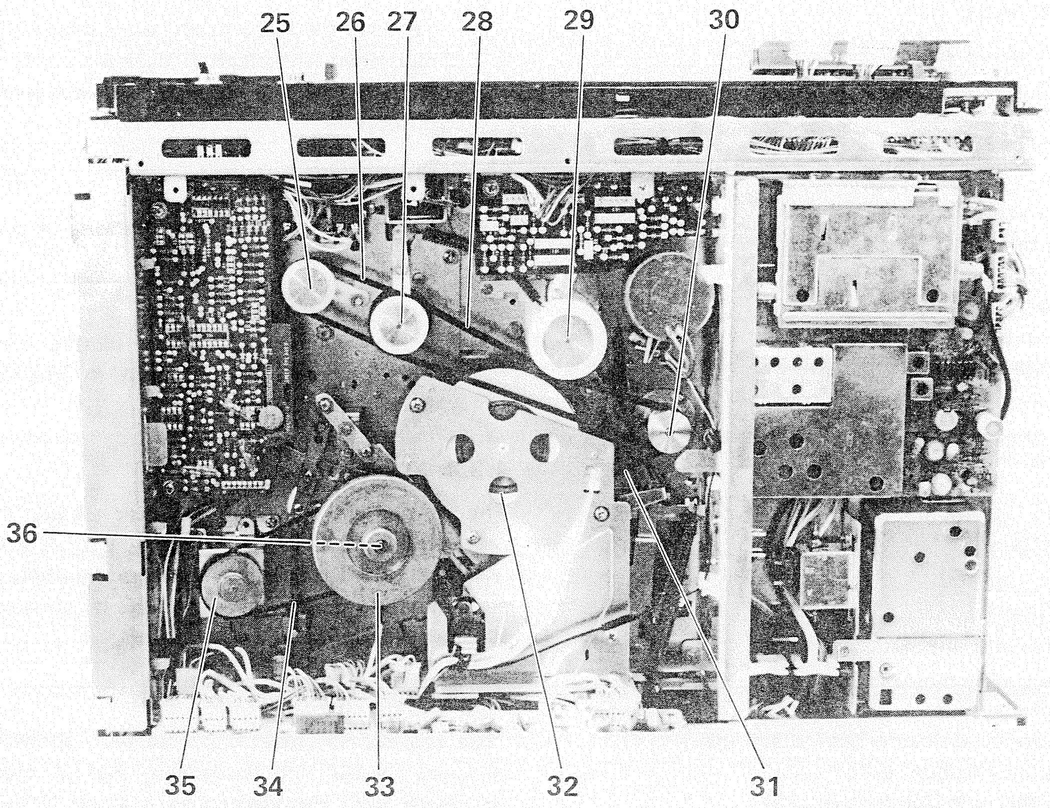


Fig. 4-3 Bottom view

25. Unloading idler
26. Unloading belt
27. REW idler
28. Reel drive belt
29. Take-up idler
30. Relay pulley (B)
31. Capstan belt
32. Capstan flywheel
33. Drum pulley
34. Drum belt
35. Drum motor pulley
36. Brushes and slipring (for electrostatic noise)

4.3 CLEANING INTERVALS

4.3.1 The following parts should be cleaned every 500 hours.

1. Supply guide roller
2. Supply (slanted) pole
3. Supply guide pole
4. Full erase head
5. Supply impedance roller
6. Supply tension pole (cue head)
7. Upper drum ass'y (Video heads)
8. Take-up (slanted) pole
9. Take-up guide roller
10. Take-up impedance roller
11. Audio/control head and audio erase head
12. Take-up guide pole
13. Pinch roller
14. Capstan shaft

4.3.2 The following parts should be cleaned every 1,000 hours.

15. Relay pulley (A)
16. Relay belt
17. Capstan motor pulley
18. Take-up idler side face
19. Counter belt (1)
20. Take-up reel disk side face (rubber tire)
21. F.F. pulley (rubber tire)
22. REW idler side face (rubber tire)
23. Supply reel disk side face
24. Unloading idler side face (rubber tire)
25. Unloading idler
26. Unloading belt
27. REW idler
28. Reel drive belt
29. Take-up idler
30. Relay pulley (B)
31. Capstan belt
32. Capstan flywheel
33. Drum pulley
34. Drum belt
35. Drum motor pulley
36. Brushes and slipring (for electrostatic noise)

4.3.3 Cleaning procedure

1. For parts other than the video heads, use gauze moistened with alcohol to perform cleaning.
2. To clean the video heads, use a soft lint-free cloth moistened with alcohol. Hold the upper drum still and very gently wipe the heads with a side to side motion.

> ***IMPORTANT:***
> *Do not use a vertical motion, as this may dislodge the ferrite chip.*

3. When cleaning rubber and plastic parts, avoid using excessive alcohol since it may accelerate deterioration of these parts.

4.3.4 Lubrication

The supply and take-up reel disk shafts should be lubricated every 2000 hours. Apply 1 or 2 drops of the specified oil to each shaft. Perform carefully to avoid contaminating rubber parts with oil. If oil is spilled, be sure to clean thoroughly with alcohol.

4.3.5 Periodically replaced parts

The replacement periods of the parts shown in Table 4-1 are typical for equipment that is used in accordance with the instruction manual. Note that the times may vary considerably according to evironmental and usage conditions. As a rule, inspect these components whenever performing major service on the machine and replace those which show obvious signs of wear or deterioration. Complete overhaul of the machine is typically performed at 5000 hour intervals.

Operating hours Name	500	1000	1500	2000	2500	3000	3500	4000	5000
Upper drum assembly	C	C/R	C	C/R	C	C/R	C	C/R	C/R
Relay belt				R				R	
Capstan belt				R				R	
Drum belt				R				R	
Reel drive belt				R				R	
Unloading belt				R				R	
Counter belt				R				R	
Take-up idler assembly		C		C/R		C		C/R	
Unloading idler assembly		C		C/R		C		C/R	
F.F. idler assembly		C		C/R		C		C/R	
Rew. idler assembly		C		C/R		C		C/R	
Pinch roller		C		C		C/R		C	C
AUDIO/C.T.L. head assembly	C	C	C	C	C	C/R	C	C	C
Supply reel disk assembly				C/L				C/L	
Take-up reel disk assembly				C/L				C/L	
Take-up reel disk rubber tire				R				R	
Rew. idler rubber tire				R				R	
Drum brush assembly		C		C/R		C		C/R	C
Cue head	C	C	C	C	C	C/R	C	C	C
Tension band assembly				R				R	
Tape guide	C	C	C	C	C	C	C	C	C
Capstan DC motor				R				R	
Drum DC motor				R				R	

Key to abbreviations: C : Cleaning
L : Lubrication
R : Replacement

Table 4-1 Maintenance schedule (normal operating conditions)

4.4 CASSETTE HOUSING REMOVAL AND INSTALLATION

4.4.1 Removal

1. Remove cassette, but leave the housing in the raised position.
2. Take out 4 screws at the left and right sides of the housing.
3. Remove the housing by lifting it upward. Use care not to damage the counter belt.
4. To operate the deck without the cassette housing, use vinyl tape to secure the cassette switch. The hinged protective cover of the cassette can be opened manually by pressing the small tab located on the right side of the cassette near the hinge. Insert the cassette and apply a suitable weight to the cassette in order to secure it in place.

4.4.2 Installation

1. This is performed with the cassette housing cover removed. Check that the vinyl tape used to secure the cassette switch is removed.
2. It is important that the left and right gears of the cassette housing are engaged evenly. Before mounting the housing in the deck, observe that the gear shaft and bottom plate of the housing are parallel.

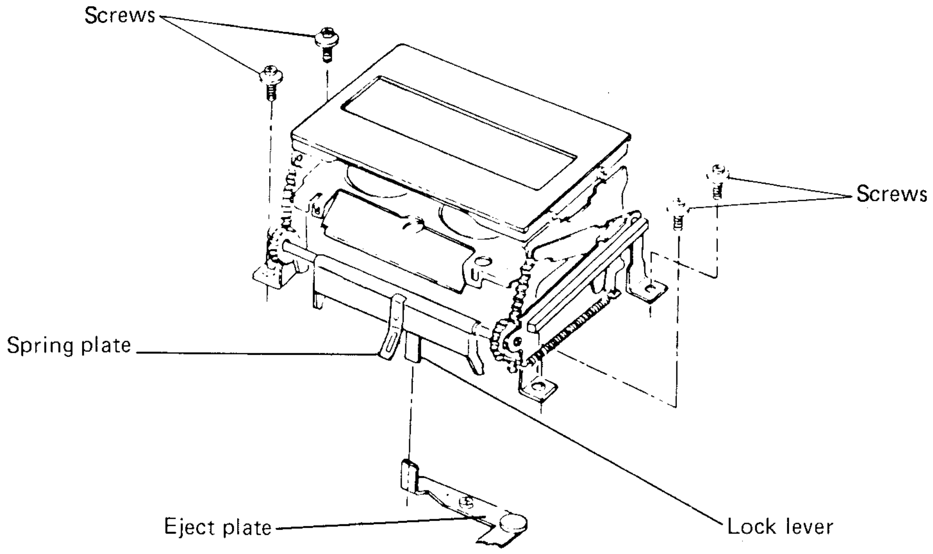


Fig. 4-4 Replacement of cassette housing

3. With the housing in the raised configuration, set the housing so that its lock lever is in front of the eject plate and the spring plate is at the rear of the function button case. Install the 4 left and right side screws, but do no tighten them firmly at this time. Use care not to disengage the counter belt. (See Fig. 4-4.)
4. Insert the cassette housing setting jig into the housing, then slowly lower the housing to the locked position. At this time, observe that the jig is positioned stably in the same manner as a cassette (not raised up within the housing).
5. Slide the housing in the forward direction so that the cassette stoppers Ⓐ and Ⓑ of the housing contact points C and D of the jig. (See Fig. 4-5.)
6. While applying pressure so that spacing is absent between Ⓐ and C, and between Ⓑ and D, tighten the 4 left and right screws firmly.
7. After tightening the screws, apply forward pressure to the jig and confirm absence of spacing at Ⓐ-C and Ⓑ-D.
8. While lightly pressing the forward central portion of the jig, raise the housing, then remove the jig.
9. Install the cassette cover and perform the following checks.
10. Insert T-120 tape (new tape is desirable) and slowly lower the housing to where it locks. Lock at the left and right of the housing should be nearly simultaneous. Also test the locking mechanism by pressing the housing at the center, left and right. The required pressure in all cases should be about the same and not excessively heavy.
11. When the housing is in the lowered position, there should be just a little front to rear play when pressure is applied to the left and right sides of the cassette.
12. Eject operation with T-120 tape shall be smooth. Also, when the housing is lowered slowly by hand to the point just before locking, then released, the housing shall rise up.
13. Abnormal noise shall be absent during FF and REW.
14. Set for play mode and check for normal tape transport.
15. Check the operation of the record safety lever. Install the top panel and again check for proper operation.
16. After installing the top panel, check eject operation and observe that the rear of the housing does not contact the top panel. With respect to the cassette cover, the top panel is installed with its rear section parallel and sides symmetrical. The cassette cover is installed in the forwardmost position.
17. Check damping operation. When the cassette housing is being lowered, the brake drum (Fig. 4-6) rotates together with the shaft in the arrow direction. However, during Eject, when the cassette housing rises, check that the stopper prevents the brake drum from rotating in the opposite direction. Perform this check for both sides.

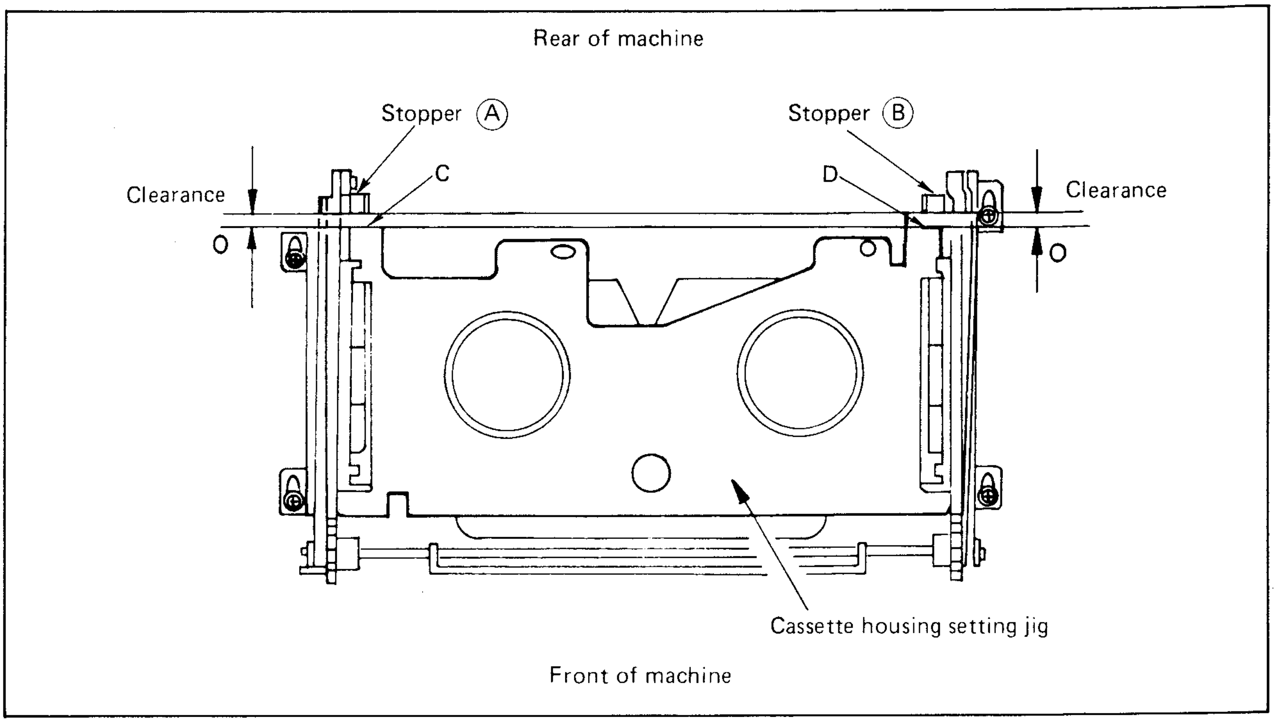

Rear of machine
Stopper Ⓐ
Stopper Ⓑ
C
D
Clearance
0
Clearance
0
Cassette housing setting jig
Front of machine

Fig. 4-5 Cassette housing setting

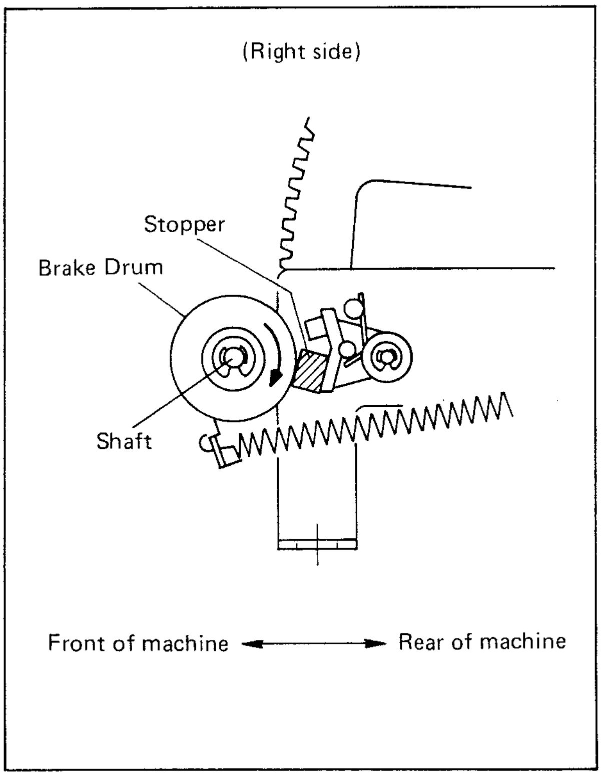

(Right side)
Stopper
Brake Drum
Shaft
Front of machine
Rear of machine

Fig. 4-6 Damping operation

4.5 MASTER PLANE JIG SETTING

1. Remove the cassette housing. As shown in Fig. 4-7. align the jig with the guide pin of the lower drum assembly and secure lightly with the accessory screw. Use care not to damage the drum or other parts.
2. Set the master plane position jig on the supply reel disk. Align the rotational position of the master plane jig with respect to the guide pin and the position jig, then tighten the screw.
3. This setting is required only when checking the position of the tension pole. At other times, approximate alignment of the master plane jig (visually) with respect to the supply reel disk is adequate.

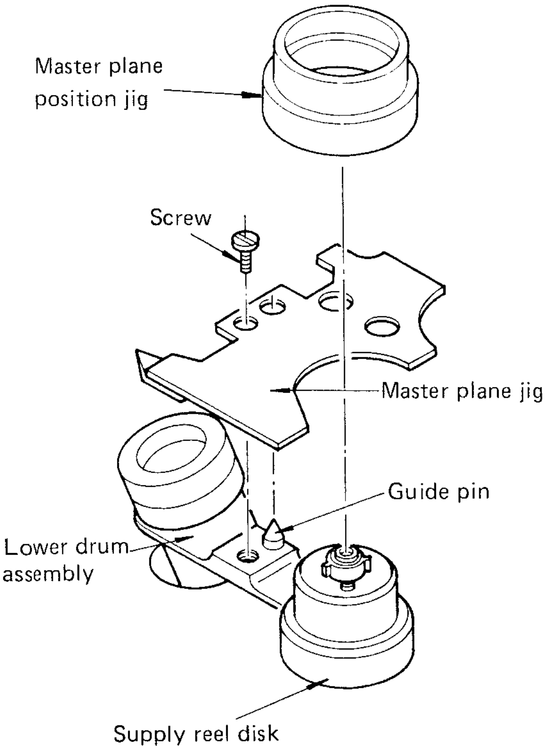

Master plane position jig
Screw
Master plane jig
Guide pin
Lower drum assembly
Supply reel disk

Fig. 4-7

4.6 SUPPLY LOADING BACK TENSION

Set T-120 tape. At the starting portion of the tape perform loading and unloading. Confirm absence of tape slackening or wrinkling in the area of the loading arm and within the cassette.

4.7 TAKE-UP LOADING BRAKE

Set T-120 tape. At the end portion of the tape, perform loading and unloading. Confirm absence of tape slackening or wrinkling in the area of the loading arm and within the cassette.

4.8 REW TORQUE

1. Remove cassette housing.
2. Without a cassette, set for REW mode (note cassette switch and start sensor).
3. Set the torque gauge on the supply reel disk as shown in Fig. 4-8. Perform measurement while allowing the torque gauge to turn so that its scale and indicator rotate at the same speed. Remove the supply reel disk load and confirm that it can be turned freely by hand.
4. Center value of the torque measurement should be more than 270 g-cm.

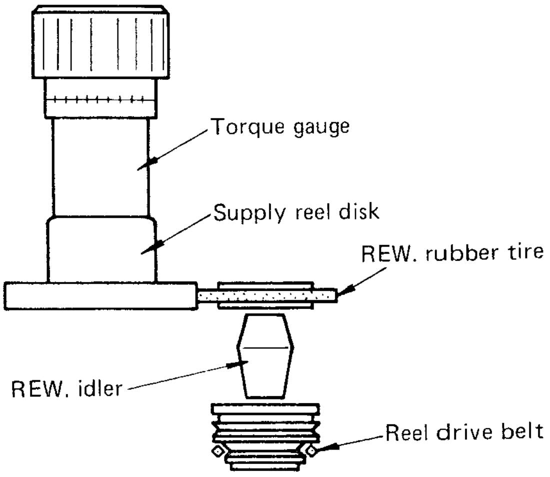

Torque gauge
Supply reel disk
REW. rubber tire
REW. idler
Reel drive belt

Fig. 4-8

5. If torque is insufficient, clean the transport system consisting of the reel drive belt, rewind idler, rubber tire of the rewind idler and side face of the supply reel disk.
6. If torque is not corrected by cleaning or if there is obvious rotational irregularity, replace the supply reel disk assembly.

4.9 FF TORQUE

1. With cassette housing removed and without using a cassette, set for the FF mode.
2. Set the torque gauge on the take-up reel disk as shown in Fig. 4-9. Perform measurement while allowing the torque gauge to turn so that its scale and indicator rotate at the same speed. Also, remove the take-up reel disk load and confirm that it can be turned freely by hand.

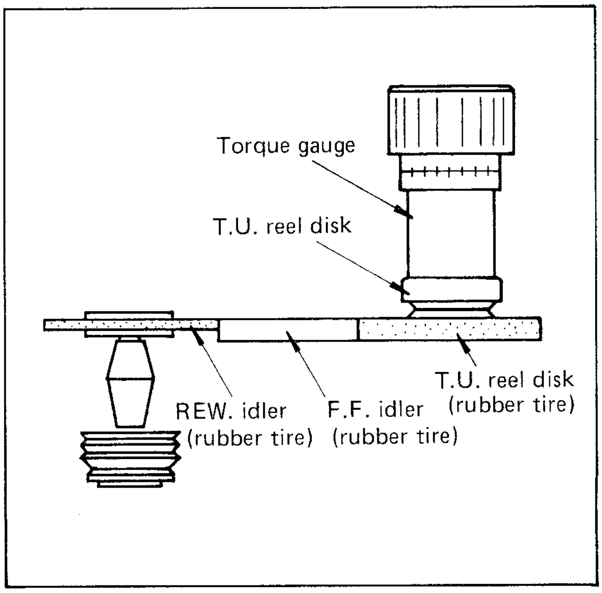


Fig. 4-9

3. Center value of the torque measurement should be more than 270 g-cm.
4. If the torque is insufficient, clean the rubber tires of the FF idler and take-up reel disk.

4.10 UNLOADING TORQUE

1. Set the torque gauge on the supply reel disk as shown in Fig. 4-10. Slightly raise the memory plate in the rearward direction and measure the torque while allowing the gauge to turn so that its scale and indicator rotate at the same speed.

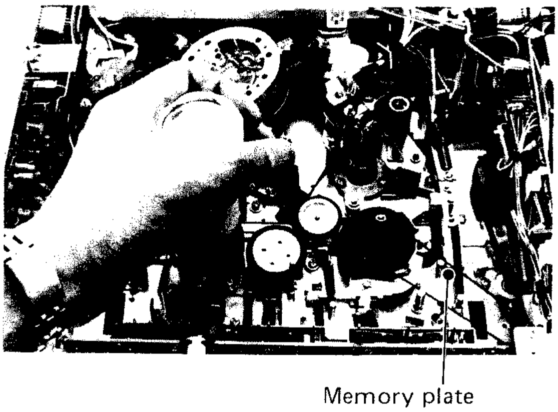


Fig. 4-10

2. Center value should be between 80 and 220 g-cm.
3. If not within this range, clean the REW pulley, unloading pulley, unloading belt and the rubber tire of the unloading idler.
4. If cleaning does not produce the correct value, replace the unloading idler assembly.

4.11 TAKE-UP TORQUE

1. With cassette housing removed and without using a cassette, set for the Play mode (note cassette switch and end sensor).
2. Set the torque gauge on the take-up reel disk as shown in Fig. 4-11. Perform measurement while allowing the gauge to turn so that its scale and indicator rotate at the same speed.
3. Center value of the torque measurement should be between 80 and 220 g-cm.
4. If not within this range, clean the reel drive belt, take-up pulley, take-up idler and rubber tire of the take-up reel disk.
5. During Play mode, check for mechanical play of the take-up idler off lever. Also, remove the load from the take-up reel disk and check for free rotation.

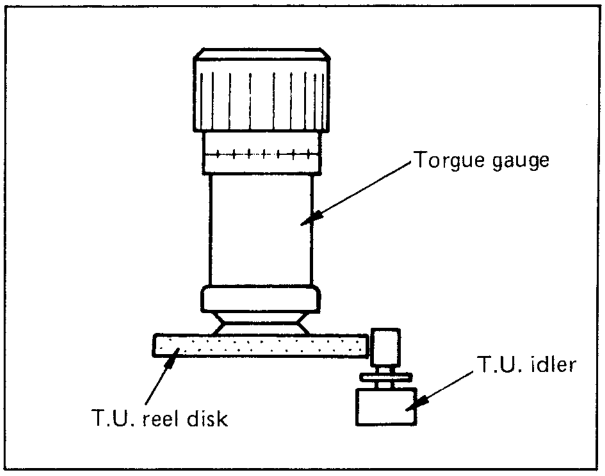

Torgue gauge
T.U. idler
T.U. reel disk

Fig. 4-11

6. If cleaning does not produce the correct torque, adjust the take-up idler coupling torque as shown in Fig. 4-12.
7. Setting the spring to a lower (direction "b") position increases the torque by approx. 30 g-cm per step. Do not set the spring at position (G).
8. If the torque cannot be corrected by the above, replace the take-up idler assembly.

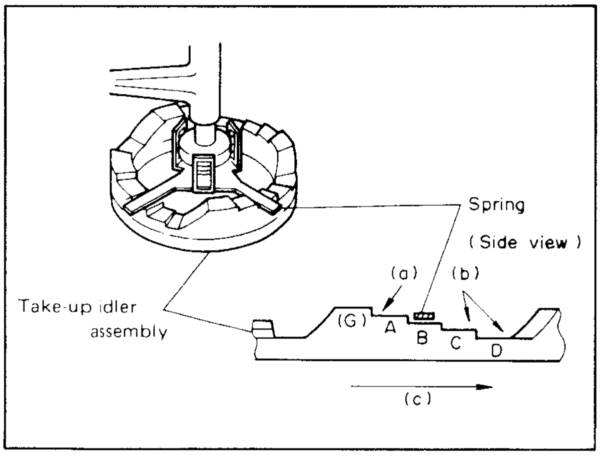

Spring
(Side view)
(a)
(b)
Take-up idler assembly
(G)
A
B
C
D
(c)

Fig. 4-12

4.12 TENSION POLE POSITION

1. Remote the cassette housing and set the master plane jig as described in section 4.5.
2. Set T-120 cassette (use only T-120 for this adjustment) and at the end portion of the tape, set for Play mode.
3. At completion of loading and when tape running starts, check for 1.5 mm spacing between point Ⓐ of the master plane jig and the tension pole as shown in Fig. 4-13.
4. If the spacing is less than 1.5 mm, loosen screw B and adjust by sliding plate C slightly toward the left.
5. Conversely, if the spacing is greater than 1.5 mm, slide plate C slightly toward the right. After adjusting, again check the spacing.

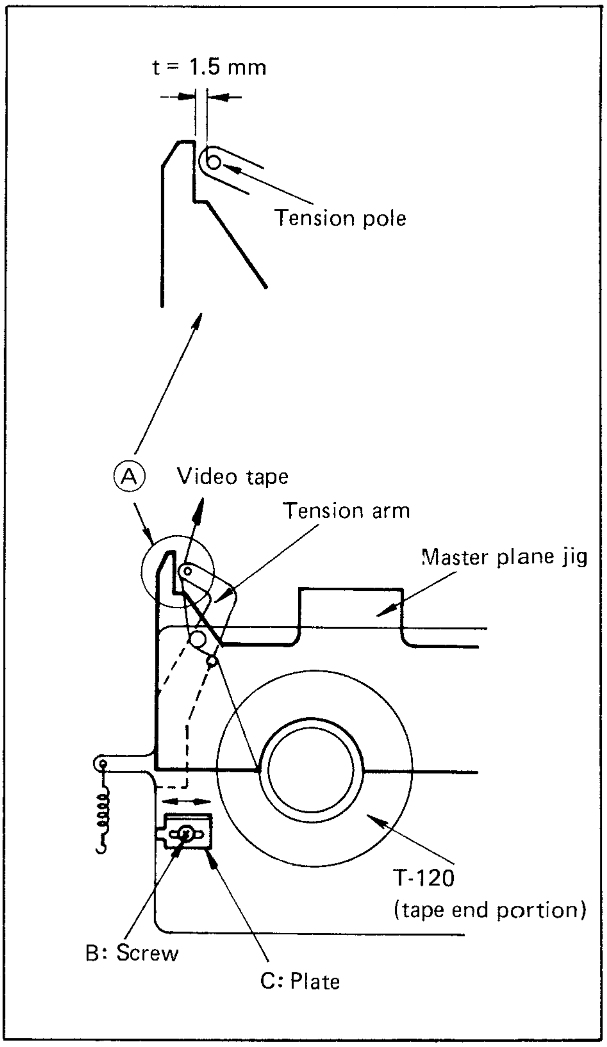

t = 1.5 mm
Tension pole
Ⓐ Video tape
Tension arm
Master plane jig
T-120
(tape end portion)
B: Screw
C: Plate

Fig. 4-13

6. Set the back tension adjustment jig as shown in Fig. 4-14 (the master plane jig is not required at this time), then set for the Play mode.
7. Check for a scale indication of between 28 and 45 g-cm at the supply side.
8. If greater than 45 g-cm, loosen screw ① and slide plate ② in the upward Ⓐ direction to obtain 35 g-cm.
9. Conversely, if the reading is less than 28 g-cm, adjust by sliding plate ② in the downward Ⓑ direction.

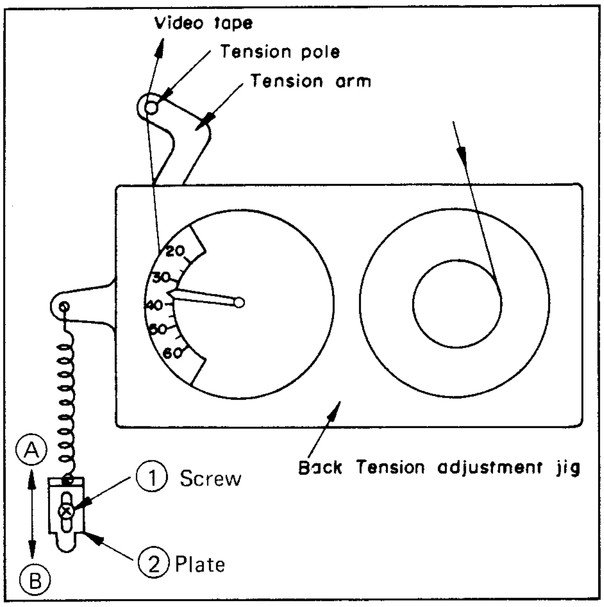

Video tape
Tension pole
Tension arm
20
30
40
50
60
Ⓐ
Ⓑ
① Screw
② Plate
Back Tension adjustment jig

Fig. 4-14

10. After reinstalling the cassette housing, insert T-120 tape and at the beginning portion of the tape, set for the Play mode. Confirm that the tension pole does not contact the housing bracket.

4.13 TAPE TRANSPORT SYSTEM CHECKS

An essential requirement in the VHS system is stable transport of the tape from the supply reel to the take-up reel without wrinkling. For this reason, extreme care is taken during tape transport adjustments at the factory.

If parts of this system (A/C head, etc.) are replaced, it is important to obtain stable tape transport by adjusting only those parts which have been replaced. Avoid disturbing other parts, since this will not only complicate adjustments, but also jeopardize compliance with VHS specifications.

4.13.1 Reel disk height

1. Remove the cassette housing and with the power switch OFF (cassette switch off), set for the REW and FF modes. With their loads removed, confirm that the supply and take-up reel disks can be turned freely by hand. The following steps are the same for both disks.

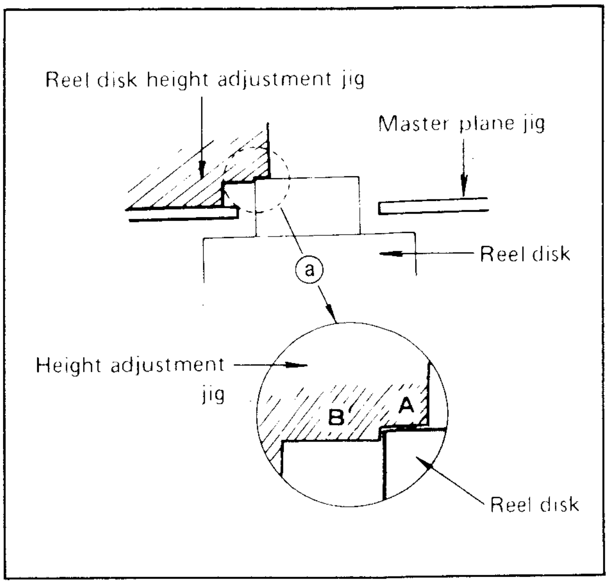

Reel disk height adjustment jig
Master plane jig
Reel disk
ⓐ
Height adjustment jig
B
A
Reel disk

Fig. 4-15

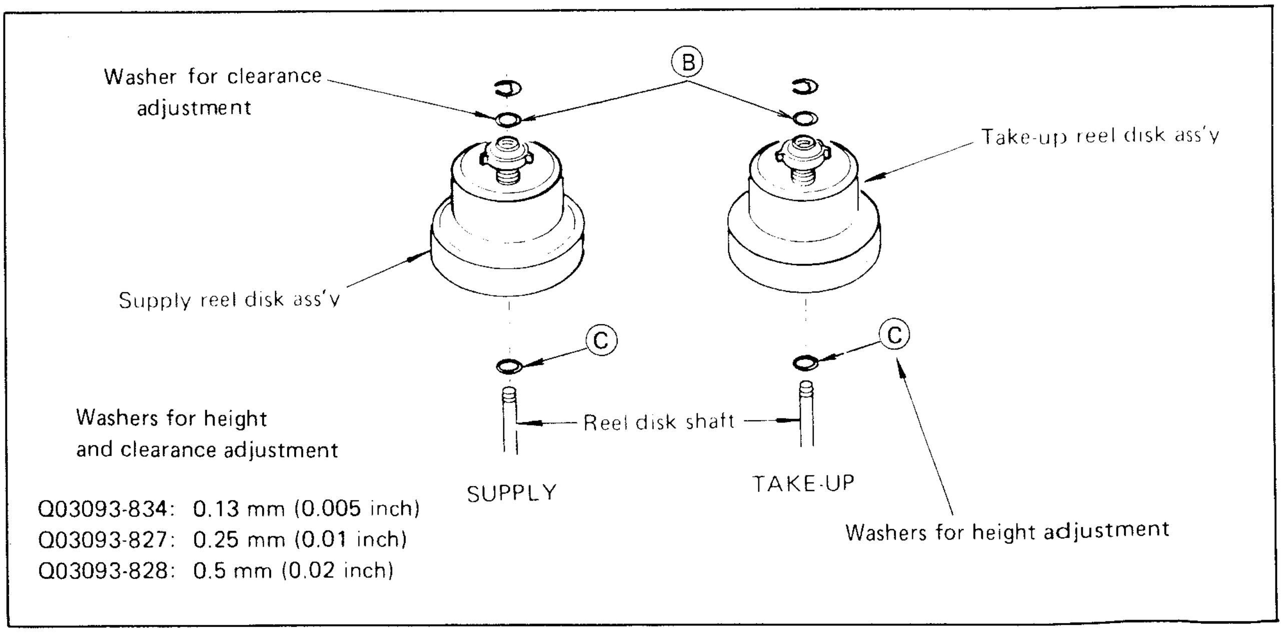

Washer for clearance adjustment
Ⓑ
Take-up reel disk ass'y
Supply reel disk ass'y
Ⓒ
Ⓒ
Washers for height and clearance adjustment
Reel disk shaft
Q03093-834: 0.13 mm (0.005 inch)
Q03093-827: 0.25 mm (0.01 inch)
Q03093-828: 0.5 mm (0.02 inch)
SUPPLY
TAKE-UP
Washers for height adjustment

Fig. 4-16

2. Set the master plane jig as described in section 4.5.
3. Use the reel disk height adjustment jig to check the height of the reel disk as shown in Fig. 4-15.
4. Measure at least two places of the disk. Point ⓐ height should be lower than step A of the jig and higher than step B.
5. If too low, change the position of washer Ⓑ (Fig. 4-16) to the bottom of the disk (so that both washers Ⓑ and Ⓒ are at the bottom).
6. Conversely, if too high, change the position of washer Ⓒ to the top of the disk (so that both washers Ⓑ and Ⓒ are at the top).
7. Remove reel disk load and by hand check for approx. 0.1 to 0.2 mm vertical play of the reel disk.

4.13.2 Full erase head and supply guide pole parallel

1. Set master plane jig and without a cassette, set for the Play mode.
2. After Play mode is obtained, set the power switch to OFF (cassette switch off).
3. Employ the height adjustment jig as shown in Fig. 4-17. Check that the full erase head and supply guide pole are essentially parallel with the jig.
4. If noticeably out of parallel, adjust by carefully bending the head arm.

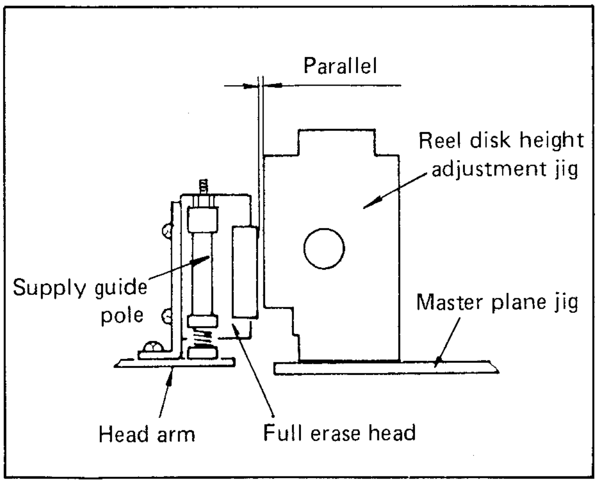

Parallel
Reel disk height adjustment jig
Supply guide pole
Master plane jig
Head arm
Full erase head

Fig. 4-17

4.13.3 Tension pole parallel

1. Set the reel disk height adjustment jig as shown in Fig. 4-18. Check that the tension pole is parallel with the jig.
2. If noticeably out of parallel, adjust by carefully bending the supply tension arm.

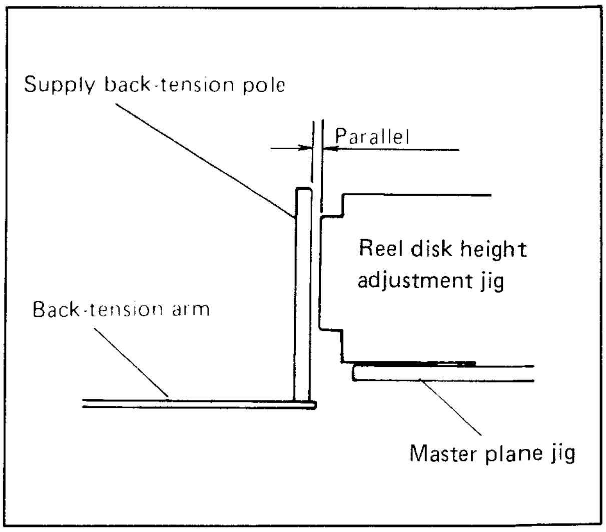

Supply back-tension pole
Parallel
Reel disk height adjustment jig
Back-tension arm
Master plane jig

Fig. 4-18

4.13.4 Take-up guide pole parallel

1. Use the reel disk height adjustment jig to check the take-up guide pole as shown in Fig. 4-19. The pole should be parallel with the jig.
2. If noticeably out of parallel, remove the guide pole and adjust by carefully bending the shaft.

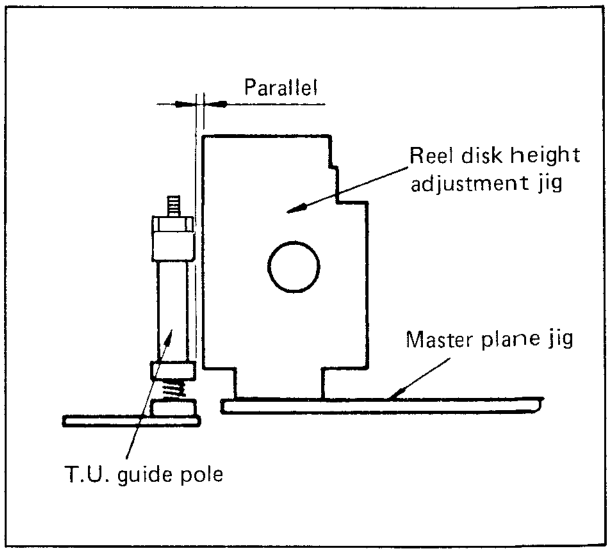

Parallel
Reel disk height adjustment jig
Master plane jig
T.U. guide pole

Fig. 4-19

4.13.5 Guide pole height

1. Use the reel disk height adjustment jig to check both the take-up and supply guide poles as shown in Fig. 4-20. The bottom of the upper lip of the pole should be even with the upper edge of the jig step shown in the figure.
2. If the height is not within ±0.5 mm, adjust by turning nut A. Afterwards, apply a dab of glue to the nut.

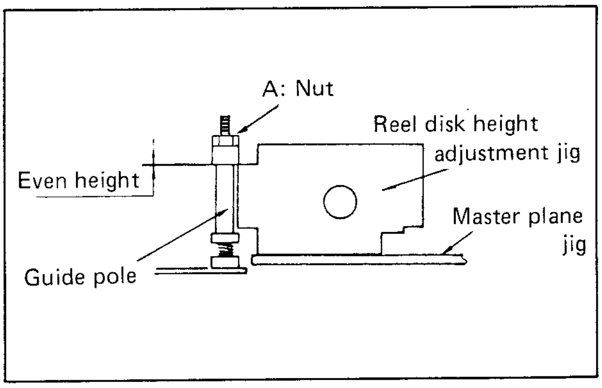

A: Nut
Reel disk height adjustment jig
Even height
Master plane jig
Guide pole

Fig. 4-20

4.13.6 Tape transport check

1. Use tape for self-recording and operate the machine several times between Play and Stop modes. Observe the tape motion in the area of the drum.
2. During the Play mode, check for tape rising or sinking particularly at point Ⓐ (drum intake) and point Ⓑ (drum output) shown in Fig. 4-21. Rising of the tape will produce contact noise between the tape edge and the video heads, while sinking of the tape may produce curling or wrinkling (sometimes with contact noise).
3. During loading, Play and unloading, observe the tape at the supply and take-up guide rollers and guide poles. Check for absence of curling or wrinkling. (See Fig. 4-22.)
4. Check the entire tape path during the Play mode for tape wrinkling or other irregularities.

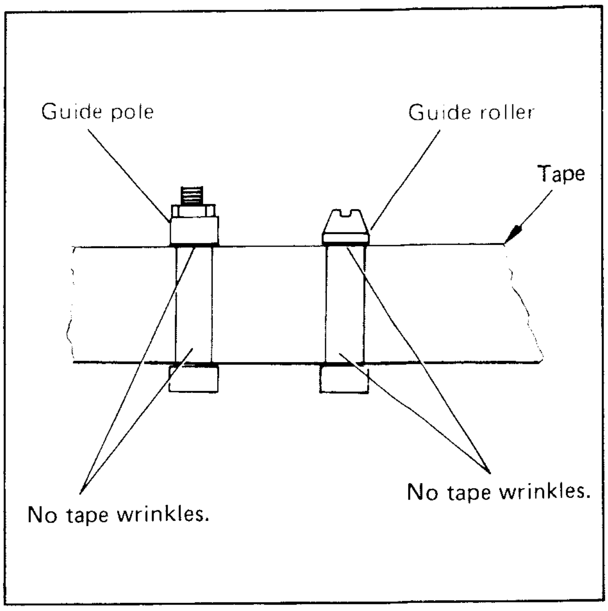

Guide pole
Guide roller
Tape
No tape wrinkles.
No tape wrinkles.

Fig. 4-22

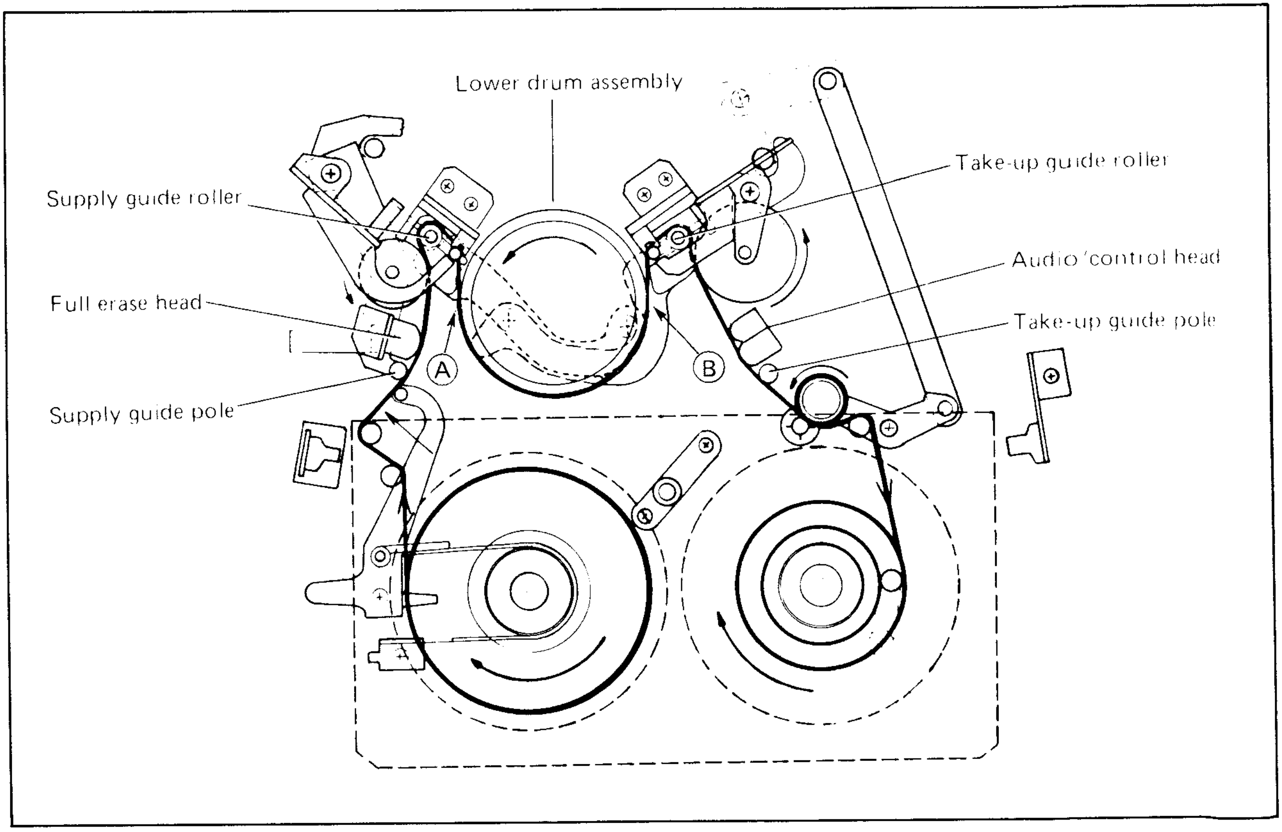

Lower drum assembly
Supply guide roller
Full erase head
Supply guide pole
Take-up guide roller
Audio/control head
Take-up guide pole
A
B

Fig. 4-21

4.14 UPPER DRUM CLEANING AND REPLACEMENT

4.14.1 Drum system cleaning

1. In the Stop mode, use a soft lint-free cloth moistened with alcohol to first clean the portions of the upper and lower drums which contact the tape. Avoid touching the video heads while performing this.
2. To clean the video heads, use one hand to hold the upper drum still. With a soft lint-free cloth moistened in alcohol, very gently wipe the video heads with a side to side motion.

> ***IMPORTANT:***
> *Do not wipe the heads with an up and down motion, as this may dislodge the video heads.*

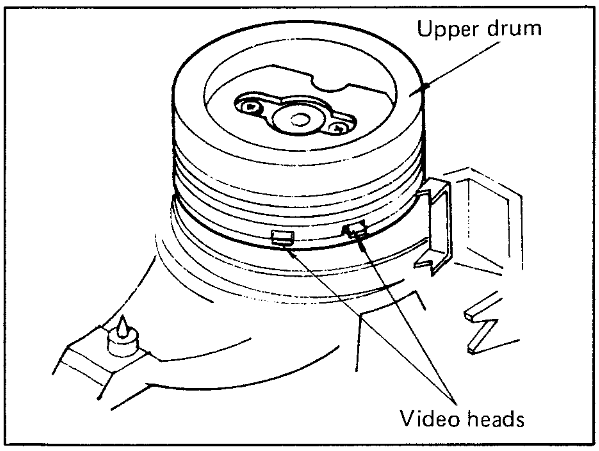

Upper drum
Video heads

Fig. 4-23

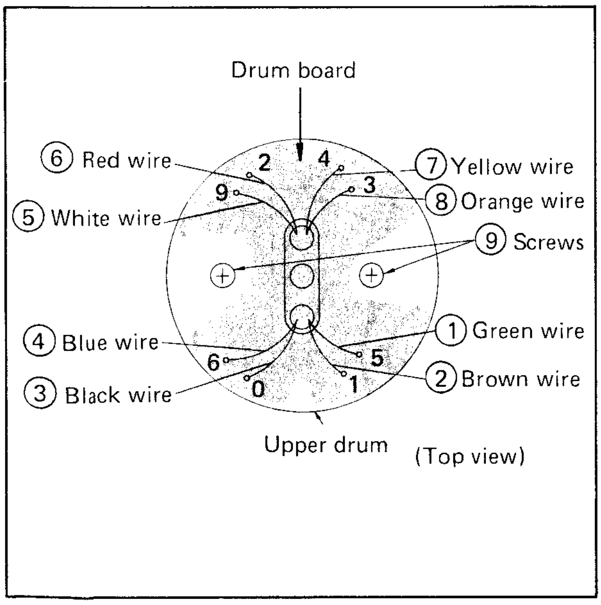

Drum board
⑥ Red wire
⑤ White wire
④ Blue wire
③ Black wire
⑦ Yellow wire
⑧ Orange wire
⑨ Screws
① Green wire
② Brown wire
2
4
9
3
6
5
0
1
Upper drum
(Top view)

Fig. 4-24

4.14.2 Upper drum replacement

1. Refer to Fig. 4-24.
2. Unsolder wires ①, ②, ③ and ④ (CH-1).
3. Unsolder wires ⑤, ⑥, ⑦ and ⑧ (CH-2).

Note: *Perform the above steps quickly to avoid overheating the wires.*

4. Take out 2 screws ⑨ , then pull the upper drum upwards to remove.
5. Use alcohol to clean the flywheel surface of the lower drum and the lower surface of the new upper drum.
6. Match the color coded wires of the new upper drum with those of the lower drum and install.
7. Secure the upper drum with 2 screws ⑨.
8. Solder wires ① through ⑧.

4.14.3 Upper drum replacement checks

After replacing the upper drum, set for the EP (6H) mode and perform the checks indicated in Table 4-2.

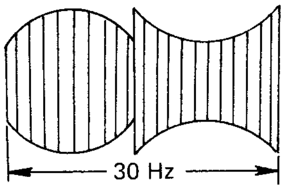
Item	Check Method	Adjustment
1. Eccentricity	1) Perform self-recording and playback. Connect oscilloscope to TP5 (Playback FM out) of the PRE/REC board. 2) In cases of severe eccentricity, the FM waveform becomes as indicated below. 	Use Micro Checker to measure eccentricity. Adjust to within 4 microns. (See item 4.14.4.)
2. Relative height	1) Perform self-recording and playback. Connect oscilloscope to TP7 (Playback Color out) of the PRE/REC board. 2) Set the TRACKING control to the center click position. 3) Poor channel balance and color flicker indicate deviations in relative height.	1) Carefully check the upper drum and flywheel for soiling, scratches, or other imperfections. 2) Retighten the two upper drum screws, using care to tighten them evenly. 3) Check for problems of eccentricity. 4) If the above measures fail to obtain proper performance, (again) replace the upper drum.

Table 4-2

4.14.4 Micro checker usage

Micro checker is the manufacturer's term for a precision instrument capable of measuring minute deviations from circularity. As a test jig for this machine, it is employed for measuring eccentricity of the upper drum.

IMPORTANT: *When using this jig, observe the following precautions.*

- *As the instrument is extremely precise, use special care not to drop it or subject to strong vibration.*
- *Do not apply strong force to the test probe.*
- *The position and direction of the holder have been preset. Do not readjust or disassemble the instrument.*
- *The outer frame of the scale can be turned about 10 scale divisions in either direction. Do not turn it forcibly (force greater than 300 g.cm).*

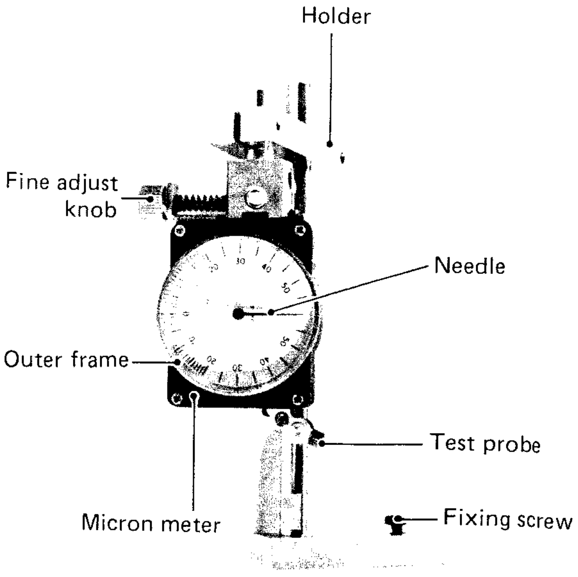


Fig. 4-25 Micro checker

1. Mounting the jig
   1) Remove the cassette cover ass'y (4 screws).
   2) Switch on the power. So that the end sensor is not activated, cover the phototransistor (by hand) and press the PLAY key.
   3) After completion of loading, switch off the power.

   Note that the micro checker cannot be mounted unless the cassette cover is removed and the loading arm is in the Play position.

> ***IMPORTANT:***
> - *Use care that the jig does not contact the video heads.*
> - *Before mounting, turn the fine adjust knob counterclockwise (to where the spring tension is no longer felt).*
> - *When mounting, observe that the test probe movement direction is toward the center portion of the upper drum.*
> - *Do NOT apply power while the jig is installed.*

   4) While observing the above cautions, set the micro checker on the lower drum guide pin as shown in Fig. 4-26. Use the accessory hex wrench (metric) to tighten the fixing screw.

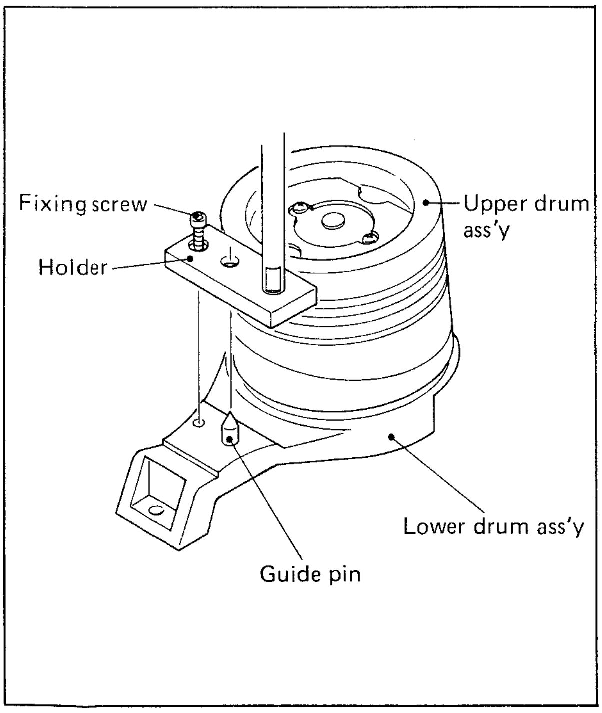


Fig. 4-26

2. Using the jig
   1) Gradually turn the fine adjust knob clockwise so that after the test probe contacts the drum. the dial indicator registers zero on the scale.
   2) While using care not to apply lateral pressure to the drum, slowly turn the upper drum and read the deviations indicated by the micro checker. See Fig. 4-27.

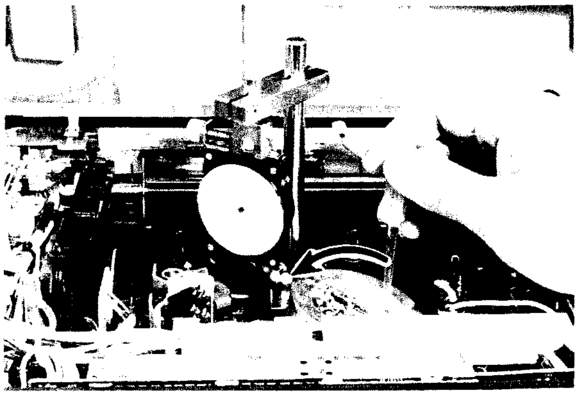


Fig. 4-27

   3) Check for needle deflection within 4 microns. If an abrasive sound is heard during measurement, check for dust or grit adhering to the test probe or drum face.
   4) If deviation is greater than 4 microns, turn the fine adjust knob counterclockwise to disengage the test probe from the drum. Loosen the 2 screws of the upper drum, carefully adjust the position, then retighten the 2 screws in a balanced manner. Afterwards, again use the micro checker to check the eccentricity.
   5) After using, turn the fine adjust knob counterclockwise and remove the micro checker.
   6) Supply power and set for the Stop mode, then reinstall the cassette cover (4 screws).

4.14.5 Checks and adjustments after replacement

Video head life is approximately 1000 hours. After replacing the upper drum, be sure to perform the following checks and adjustments.

1. Tape transport and FM envelope
2. Playback switching point
3. Recording switching point
4. Tracking preset
5. Tracking control function
6. Video head resonance and Q
7. FM channel balance
8. Playback color channel balance and color level

9. Recording color channel balance and color level
10. FM output level

The above checks and adjustments are described in the electrical adjustments section of this manual.

4.15 TAKE-UP REEL DISK MAINTENANCE

4.15.1 Inspection

1. With the power switch off, set for the REW mode. Disengage the counter belt from the take-up reel disk and remove all loads from the disk.
2. Check that the take-up reel disk can be turned easily and smoothly by hand. If the rotation is not smooth, check for 0.1 to 0.2 mm vertical play of the reel disk.
3. If play is insufficient, perform the reel disk height adjustment of section 4.13.1. However, note that excessive play can cause fluctuations in the reel disk height.
4. If play is adequate, but rotation not smooth, perform lubrication according to the following steps.

4.15.2 Cleaning and lubrication

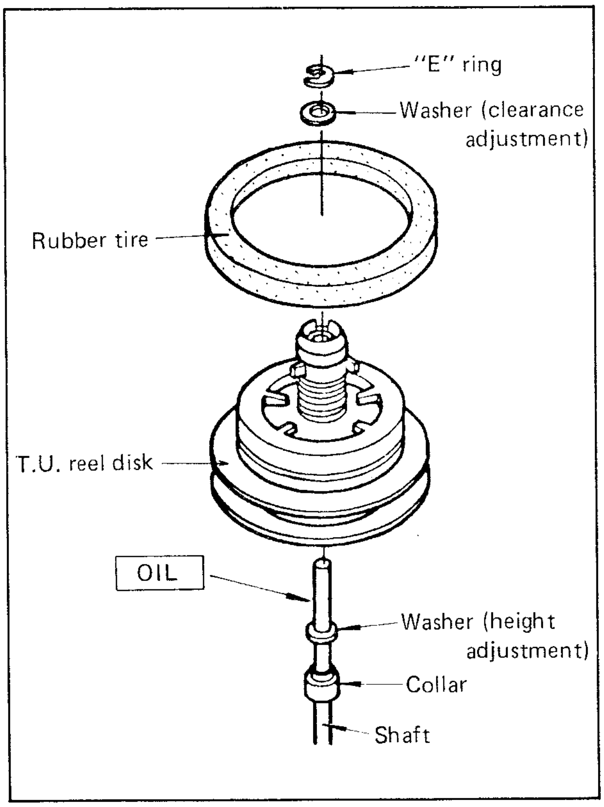

"E" ring
Washer (clearance adjustment)
Rubber tire
T.U. reel disk
OIL
Washer (height adjustment)
Collar
Shaft

Fig. 4-28

1. Refer to Fig. 4-28. Remove the E-ring, then the upper washer, take-up reel disk and lower washer. Use care not to misplace or interchange the washers.
2. Clean these parts and the shaft with alcohol.
3. Inspect the rubber tire. If it shows signs of uneven wear, deformation or deterioration, replace it. Be sure to install the new rubber tire evenly.
4. Apply 1 or 2 drops of oil to the shaft, then re-assemble the reel disk.

4.16 SUPPLY REEL DISK MAINTENANCE

4.16.1 Inspection

1. With power switch off, set for the FF mode. Remove loads from the supply reel disk.
2. Check that the supply reel disk can be turned easily and smoothly by hand. If the rotation is not smooth, check for 0.1 to 0.2 mm vertical play of the reel disk.
3. If play is insufficient, perform the reel disk height adjustment of section 4.13.1. However, note that excessive play can cause fluctuations in the reel disk height.
4. If play is adequate, but rotation not smooth, perform lubrication according to the following steps.

4.16.2 Cleaning and lubrication

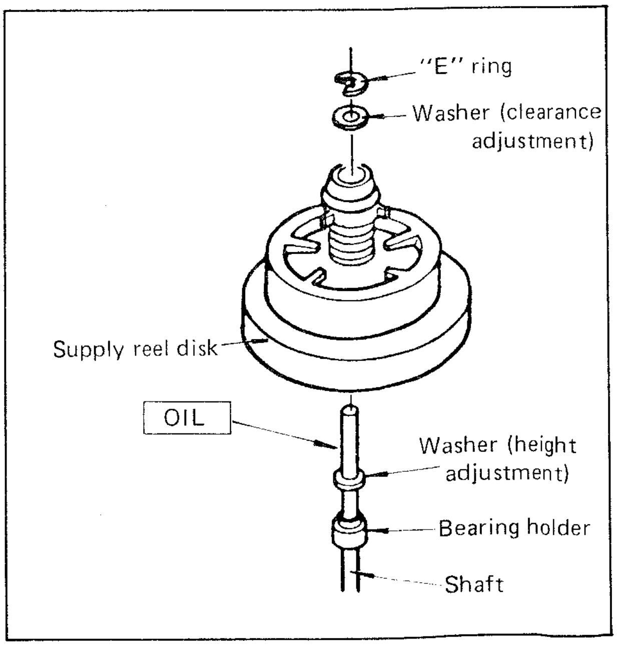

"E" ring
Washer (clearance adjustment)
Supply reel disk
OIL
Washer (height adjustment)
Bearing holder
Shaft

Fig. 4-29

1. Refer to Fig. 4-29. Remove the E-ring, then the upper washer, supply reel disk and lower washer. Use care not to misplace or interchange the washers.
2. Clean these parts and the shaft with alcohol.
3. Apply 1 or 2 drops of oil to the shaft, then reassemble the reel disk.

4.17 TAKE-UP IDLER CLEANING AND REPLACEMENT

4.17.1 Cleaning

1. Disengage the reel drive belt.
2. Use alcohol to clean the reel drive belt and the portions of the take-up idler assembly that are contacted by the belt.

4.17.2 Replacement

1. Remove the E-ring (see Fig. 4-30), disengage spring Ⓐ and remove the take-up idler assembly from the shaft.
2. After installing the new take-up idler assembly, perform the take-up torque adjustments of section 4.11.

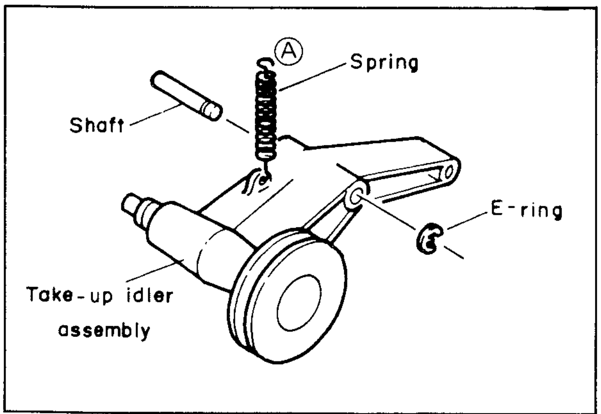


Fig. 4-30

4.18 REWIND IDLER CLEANING AND REPLACEMENT

4.18.1 Cleaning

1. Remove the reel drive belt and unloading belt.
2. Use alcohol to clean the belts, parts of the idler assembly contacted by the belts, rubber tire of the rewind idler and the FF pulley.
3. Inspect the rubber tire and replace it if it shows signs of uneven wear or deformation. Be sure to install the new rubber tire evenly.

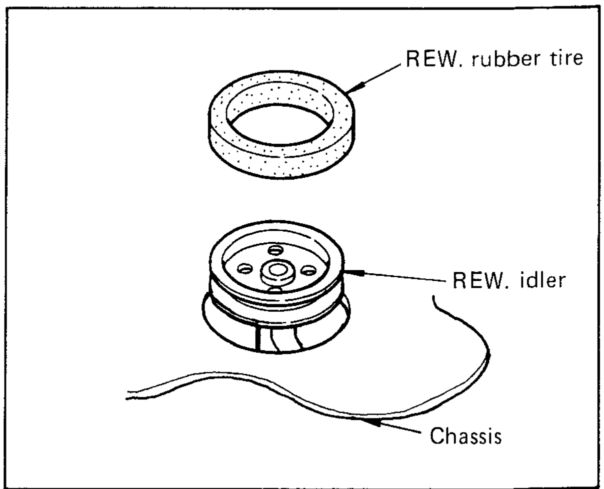


Fig. 4-31

4.18.2 Replacement

1. Remove the rewind idler rubber tire.
2. Refer to Fig. 4-32. Take off the E-ring and spring Ⓐ, then remove the assembly from the shaft.
3. Install a new REW idler assembly, then install the REW rubber tire.
4. Check rewind torque according to section 4.8.

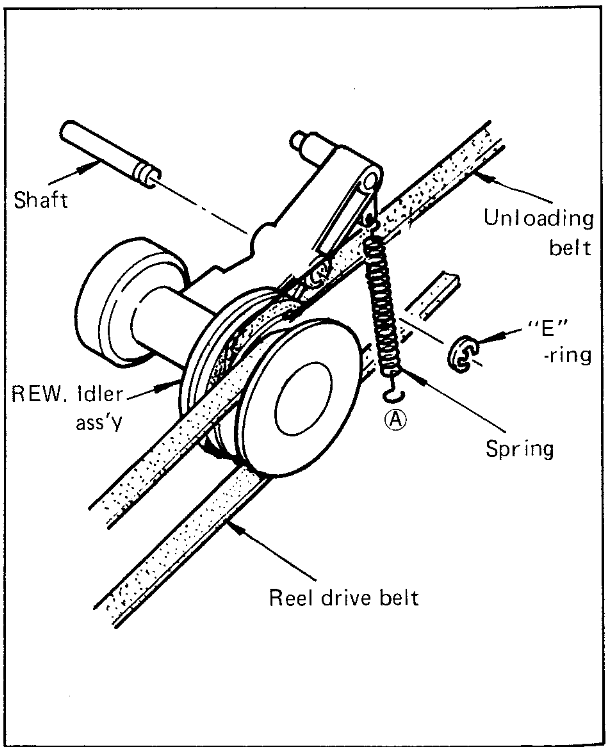


Fig. 4-32

4.19 UNLOADING IDLER CLEANING AND REPLACEMENT

4.19.1 Cleaning

1. Remove the unloading belt.
2. Use alcohol to clean the unloading belt, portions of the idler assembly contacted by the belt and the unloading rubber tire (from upper side of chassis).

4.19.2 Replacement

1. Remove the E-ring and disengage spring Ⓐ, then remove the idler assembly from the shaft. Install new idler assembly (including rubber tire).
2. Perform unloading torque checks of section 4.10.

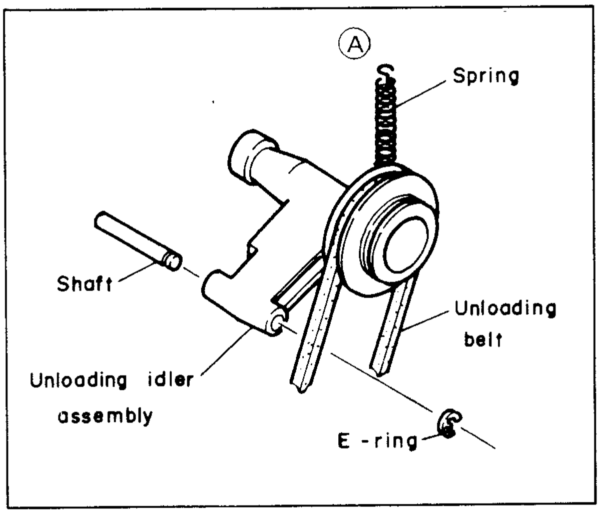

Ⓐ
Spring
Shaft
Unloading belt
Unloading idler assembly
E-ring

Fig. 4-33

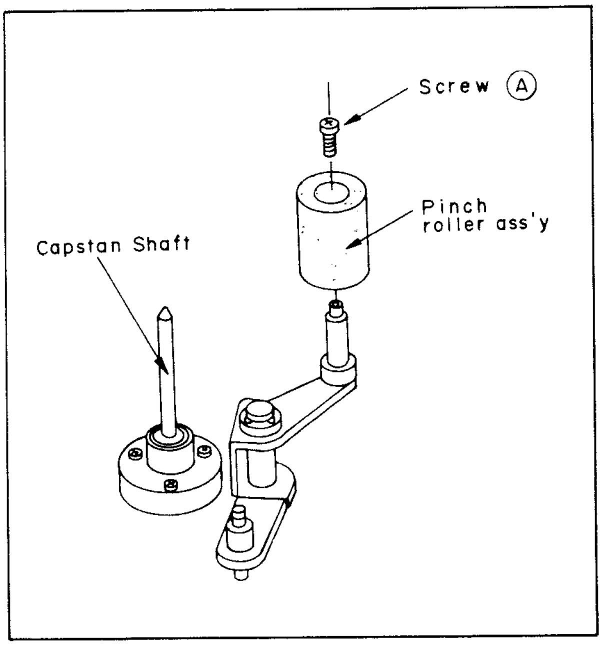

Screw Ⓐ
Pinch roller ass'y
Capstan Shaft

Fig. 4-34

4.20 PINCH ROLLER CLEANING AND REPLACEMENT

4.20.1 Cleaning

Use alcohol to clean the capstan shaft and pinch roller.

4.20.2 Replacement

Refer to Fig. 4-34. Take out screw Ⓐ and remove the pinch roller assembly.

4.21 AUDIO/CONTROL HEAD MAINTENANCE

4.21.1 Cleaning

Use alcohol to clean the audio erase head, audio/control head and take-up guide pole. See Fig. 4-35.

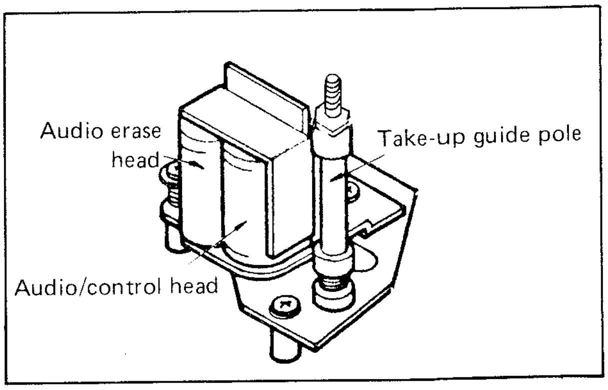

Audio erase head
Take-up guide pole
Audio/control head

Fig. 4-35

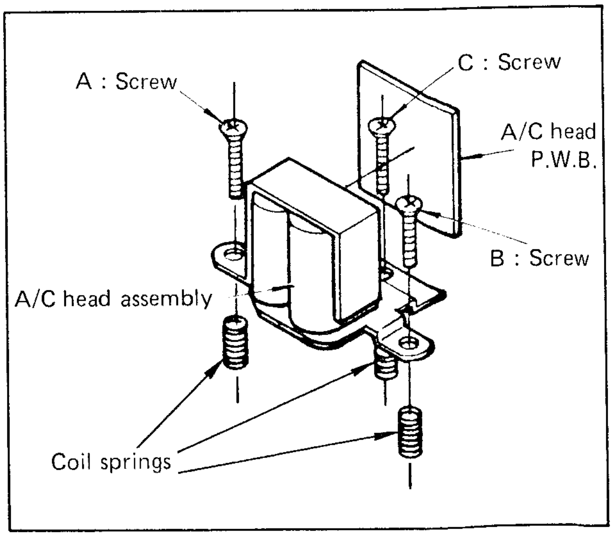

A : Screw
C : Screw
A/C head P.W.B.
B : Screw
A/C head assembly
Coil springs

Fig. 4-36

4.21.2 Replacement

1. Refer to Fig. 4-36. Take out screws A, B and C, then remove the A/C head subassembly. Use care regarding the coil springs.
2. Carefully unsolder the A/C head board.
3. Install new A/C head and perform the following adjustments.

4.21.3 Tape path

1. Use self-recording tape and set for the Play mode.
2. Refer to Fig. 4-37. Observe the tape motion at the take-up impedance roller, A/C head, take-up guide pole and capstan shaft. Smooth and evenly flat tape motion is important.
3. Observe that the tape does not ride up at the edge of the take-up gide pole and small wrinkles are not formed.

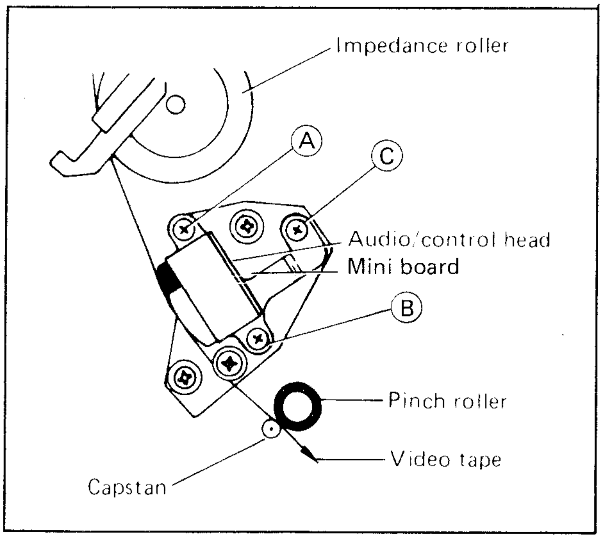


Fig. 4-37

4. If necessary, adjust by turning screws Ⓐ , Ⓑ and Ⓒ . Turn these screws by small increments at time.

> ***IMPORTANT:***
> *Do not disturb the take-up guide pole.*

5. Required height of the A/C head is as shown in Fig. 4-38. Adjust by turning screws Ⓐ , Ⓑ and Ⓒ.

4.21.4 A/C head height and azimuth

1. Be sure to first check for smooth tape motion using the self-recording tape. Since the alignment tape is used in the following steps, improper tape motion can damage the alignment tape.
2. Play the audio 7 kHz portion (video stairstep) of the alignment tape and connect an oscilloscope to TP-1 (AUDIO OUT) of the AUDIO board.
3. Carefully adjust screws Ⓐ , Ⓑ and Ⓒ by small increments at a time to obtain maximum audio output level. Note that screw Ⓒ also adjusts front to rear inclination of the head. Adjustment is therefore performed for maximum output level together with minimum level fluctuations.
4. Again check for smooth tape motion, then perform audio circuit and servo circuit adjustments. Refer to the electrical adjustments section of this manual.
5. After completing audio and servo electrical adjustments, play the MH-1 alignment tape (stairstep signal). Connect oscilloscope to TP-5 (PB FM OUT) of the PRE/REC board and confirm absence of appreciable difference in FM output level at the PRESET and maximum MANUAL positions of the TRACKING control.

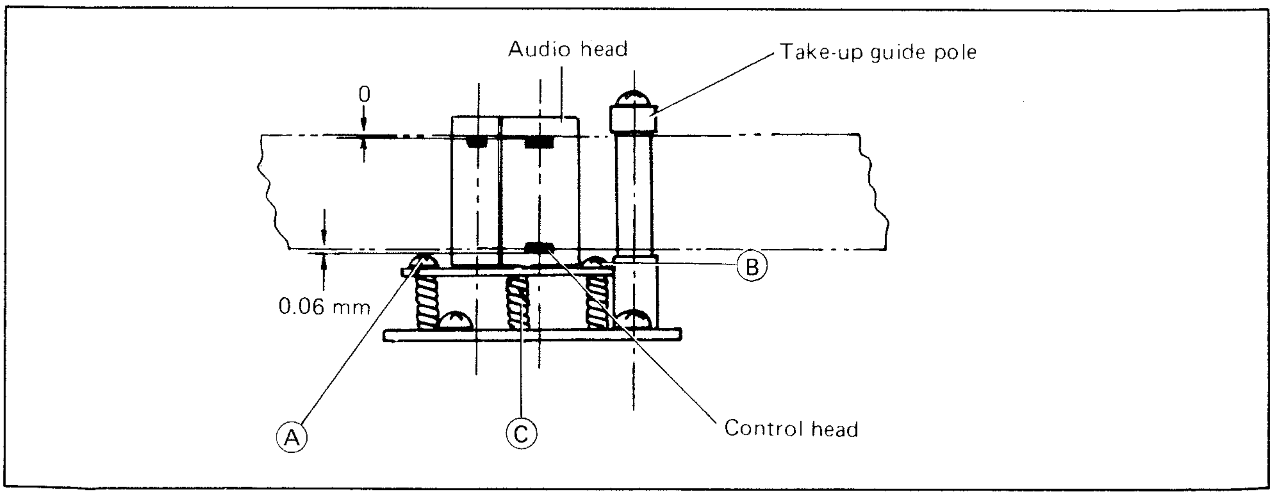


Fig. 4-38

4.22 DRUM MOTOR REPLACEMENT

1. The drum motor is installed on the rear of the chassis. Take out 3 screws Ⓐ (Fig. 4-39) and remove the motor together with the pulley.
2. Loosen setscrew Ⓑ (Fig. 4-40) with a metric hex key and remove the pulley.
3. Take out 3 screws Ⓒ and remove the motor bracket.
4. Mount the motor bracket to the new motor with screws Ⓒ.

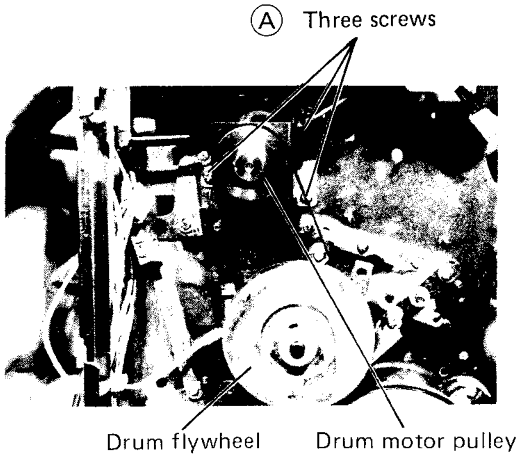

Ⓐ Three screws
Drum flywheel
Drum motor pulley

Fig. 4-39

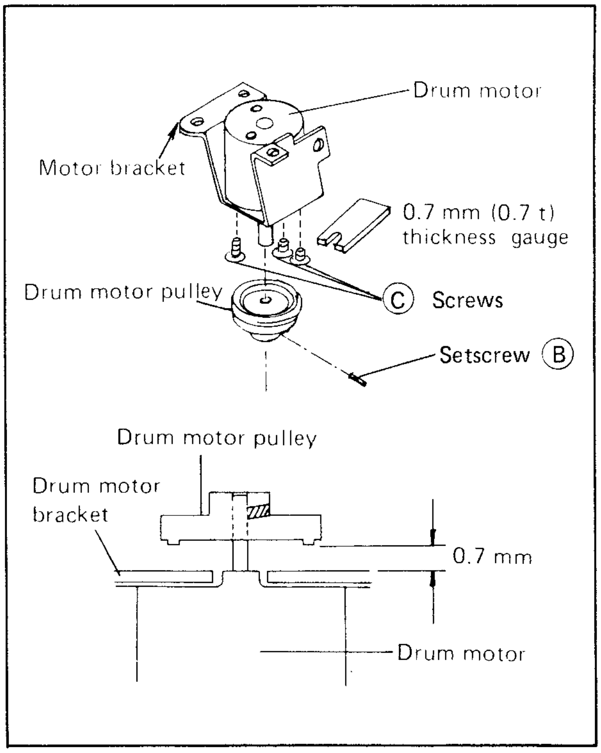

Drum motor
Motor bracket
0.7 mm (0.7 t) thickness gauge
Drum motor pulley
Ⓒ Screws
Setscrew Ⓑ
Drum motor pulley
Drum motor bracket
0.7 mm
Drum motor

Fig. 4-40

5. To install the pulley, use the 0.7 mm thickness gauge as shown in Fig. 4-40. Press the motor shaft inward (to compensate for mechanical play) and mount the pulley with 0.7 mm spacing between the pulley and the motor bracket.
6. Perform drum servo circuit adjustments as described in the electrical adjustments section of this manual.

4.23 CAPSTAN MOTOR REPLACEMENT

1. Take out 4 screws A (Fig. 4-41) from the upper side of the chassis and remove the motor together with the connecting lever.
2. Use a metric hex key to loosen setscrew B (Fig. 4-42) and remove the capstan motor pulley.

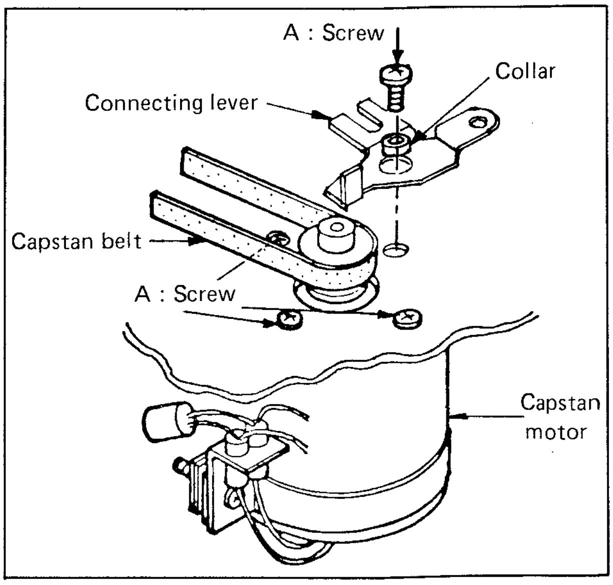

A : Screw
Collar
Connecting lever
Capstan belt
A : Screw
Capstan motor

Fig. 4-41

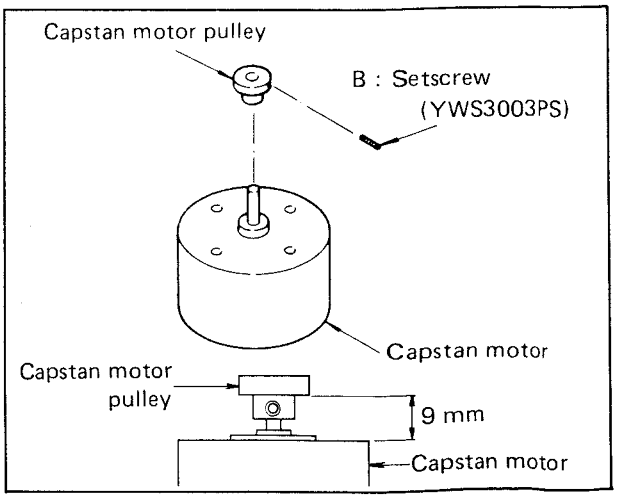

Capstan motor pulley
B : Setscrew (YWS3003PS)
Capstan motor
Capstan motor pulley
9 mm
Capstan motor

Fig. 4-42

3. Install the pulley on the new motor as shown in Fig. 4-42. Press the motor shaft inward (to compensate for mechanical play) and mount the pulley with 9.0 mm spacing.
4. Perform capstan servo circuit adjustments as described in the electrical adjustments section of this manual.

4.24 DRUM BRUSH ASSEMBLY MAINTENANCE

4.24.1 Cleaning

1. Loosen setscrew A (Fig. 4-43) and remove the drum pulley.
2. Take out 2 screws B and remove the brush assembly.
3. Take out 3 screws C and remove the pick-up head bracket.
4. Use alcohol to clean the slipring, shaft and brush assembly.
5. To reassemble, or to replace the brush assembly, refer to the following steps.

4.24.2 Replacement

1. Mount (new) brush assembly to the pick-up head bracket with 2 screws B (Fig. 4-43), but do not tighten the screws.
2. Secure the pick-up head to the lower drum with 3 screws C .
3. So that the 2 brushes contact the slipring in parallel, tighten the 2 screws B .
4. Set the pulley fully onto the shaft, align the setscrew with the flat portion of the shaft, then tighten the setscrew.
5. Clean the drum belt with alcohol, then engage.

4.25 TENSION BAND REPLACEMENT

1. Take out screws Ⓐ and Ⓑ, then remove the tension band. See Fig. 4-44.
2. Use care not to forcibly bend the new tension band. Install it with screw Ⓑ and screw Ⓐ (with collar).

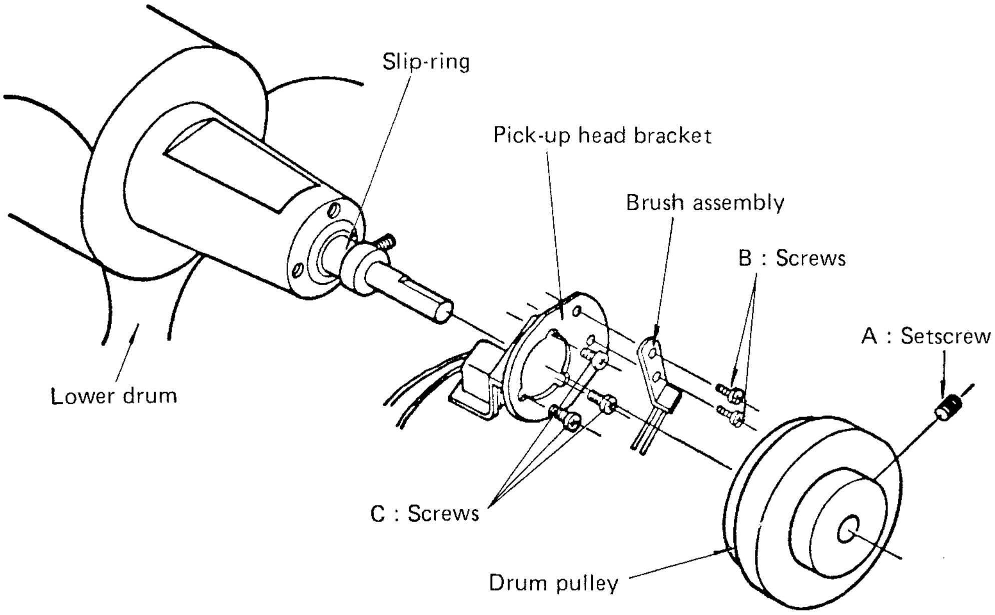


Fig. 4-43

3. Gently move the tension arm by hand and check that the collar rotates freely.
4. Perform the tension pole position and back tension adjustments of section 4.12.

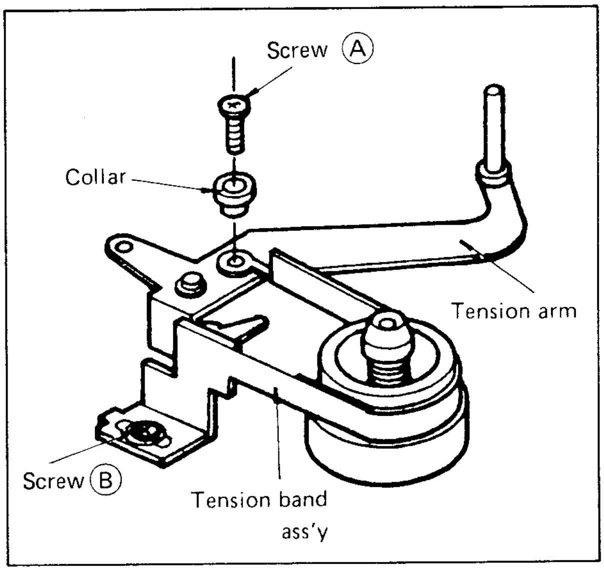

Screw Ⓐ
Collar
Tension arm
Screw Ⓑ
Tension band ass'y

Fig. 4-44

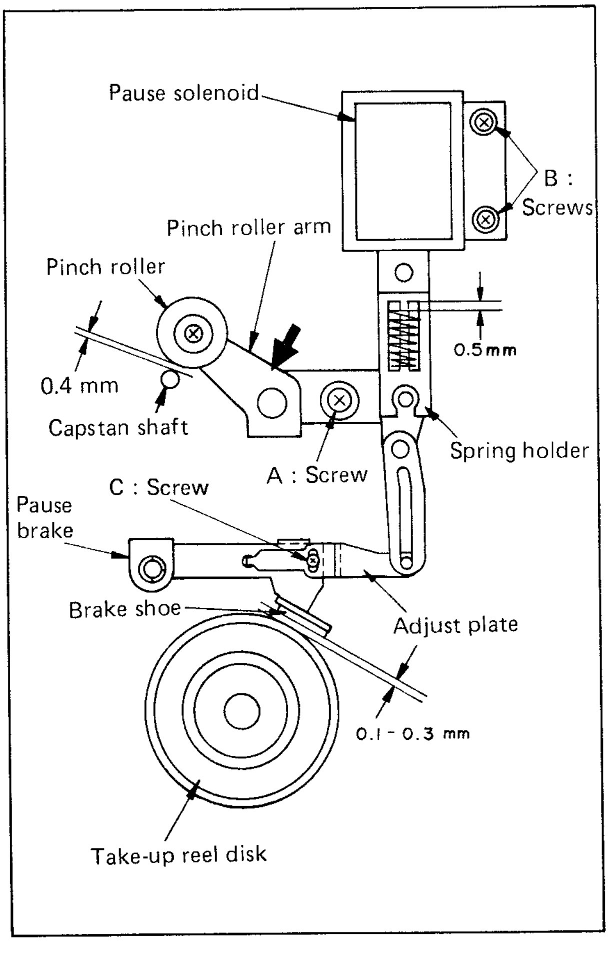

Pause solenoid
B : Screws
Pinch roller arm
Pinch roller
0.5mm
0.4 mm
Capstan shaft
A : Screw
Spring holder
C : Screw
Pause brake
Brake shoe
Adjust plate
0.1 - 0.3 mm
Take-up reel disk

Fig. 4-45

4.26 PAUSE SOLENOID INSPECTION AND ADJUSTMENT

4.26.1 Inspection

1. Without a cassette, set for the REC Pause mode (note cassette switch and end sensor) and set power off.
2. See Fig. 4-45. Check for 0.4 mm spacing between the pinch roller and the capstan shaft (0.5 mm gauge does not fit in space).
3. Set for the Play mode (power on) and check for approx. 0.5 mm spacing between the spring holder and the end of the spring.
4. At this time, also check for 0.1 to 0.3 mm spacing between the pause solenoid brake shoe and the take-up reel disk.
5. Again set for the REC Pause mode (power on) and gently turn the take-up reel disk by hand in both directions. Confirm that the brake is applied firmly.

4.26.2 Adjustment

1. Loosen screw A and 2 screws B (Fig. 4-45).
2. Set for the REC Pause mode (power off). Insert the 0.3 mm thickness gauge between the pinch roller and capstan shaft. While gently pressing the pinch roller arm in the direction shown by the arrow, tighten screw A .
3. Set for the Play mode (power on). Adjust the front to rear position of the pinch roller solenoid to obtain approx. 0.5 mm spacing between the spring holder and the end of the spring. Tighten screws B .
4. In this condition, loosen screw C and adjust for 0.1 to 0.3 mm spacing between the brake shoe and the take-up reel disk.
5. Repeat the inspection steps of 4.26.1.

4.27 FG BOARD SETTING JIG

The FG (frequency generator) board must be removed in order to replace the capstan belt. After replacing the belt, this jig is required for obtaining mechanical center when reinstalling the FG board.

1. Refer to Fig. 4-46 and 4-47. Loosen 3 screws Ⓐ .
2. Place the jig as shown in the figures.
3. As shown in Fig. 4-46, align steps Ⓑ and Ⓒ of the jig with the FG board and the raised portion of the flywheel.
4. With the jig in place, carefully tighten 3 screws Ⓐ.
5. Remove the jig.

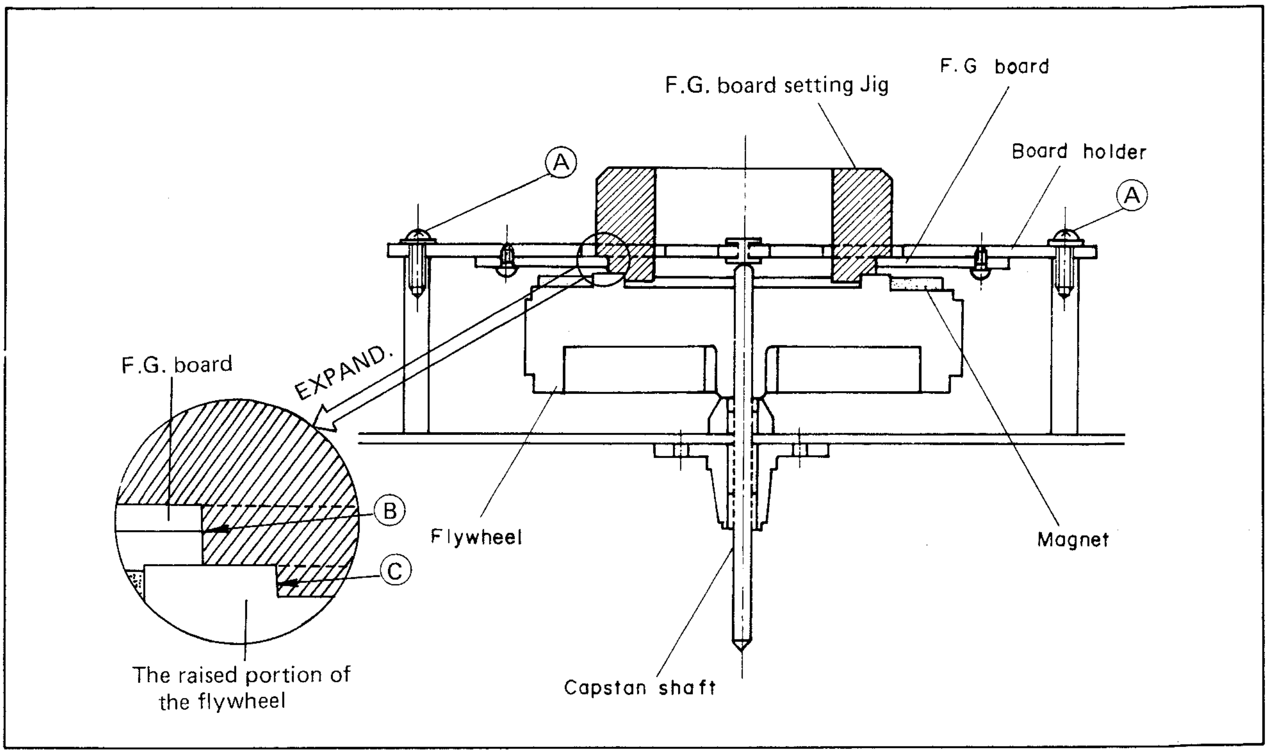

F.G. board setting Jig
F.G board
Board holder
Ⓐ
Ⓐ
F.G. board
EXPAND.
Ⓑ
Ⓒ
Flywheel
Magnet
The raised portion of the flywheel
Capstan shaft

Fig. 4-46

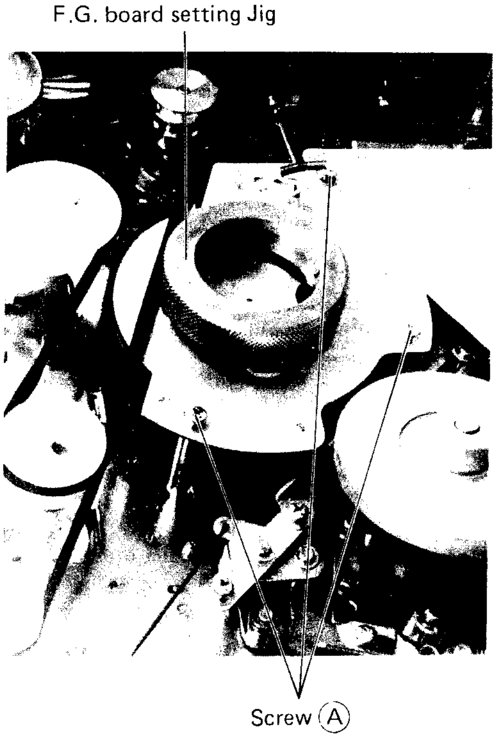

F.G. board setting Jig
Screw Ⓐ

Fig. 4-47

SECTION 5
ELECTRONIC ADJUSTMENTS

5.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts. It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

5.1.1 Required test equipment

1. Digital voltmeter: HEWLETT-PACKARD Model 3476A/B or equivalent
2. Oscilloscope: Wide-band, Dual-trace
3. Signal generator: Color bar, Stairstep
4. Frequency counter: HEWLETT-PACKARD Model 5381A or equivalent
5. Regulated DC power supply
6. Audio generator
7. Alignment tape: JVC MH-1 and MH-1L

NOTE: *Be sure to first check for smooth and proper tape transport before using the alignment tape.*

5.1.2 JVC alignment tape contents

1. MH-1 (Standard Play)

Segment	Playback Time	Video Signal	Audio Signal	Applications
1	10 minutes	Stairstep	7 kHz	● Interchangeability checks and adjustments ● Servo circuit checks and adjustments ● Audio head azimuth adjustments Note: Set the TRACKING control to the center (click) position.
2	5 minutes	(none)	3 kHz	● Tape speed checks ● Wow and flutter checks
3	10 minutes	Color bar	1 kHz	● Video signal playback circuit checks and adjustments ● Audio signal playback circuit checks and adjustments Note: Set the TRACKING control to MANUAL and adjust for maximum FM output level at TP-5 (PB FM OUT) of the PRE/REC board.
4	3 minutes	RF sweep	(none)	● Video head resonance adjustments Marker: 4.5 MHz

Table 5-1 MH-1 contents

2. MH-1L (Extended Play)

Segment	Playback Time	Video Signal	Audio Signal	Applications
1	5 minutes	Stairstep (CH-1 only)	(none)	● Servo circuit checks and adjustments Notes: Set the TRACKING control to the center (click) position. Do not use this tape for interchangeability checks or adjustments.
2	5 minutes	Color bar	(none)	● Video signal playback circuit checks and adjustments Note: Set the TRACKING control to MANUAL and adjust for maximum FM output level.
3	3 minutes	RF sweep	(none)	● Video head resonance adjustments Marker: 4.2 MHz

Table 5-2 MH-1L contents

5.2 POWER SUPPLY CIRCUIT CHECKS AND ADJUSTMENTS

5.2.1 Regulated 12 V DC

1. With power on, set for the Stop (E-E) mode.
2. Use a digital voltmeter to check for DC 12.3 V ±0.1 V at TP-1 of the REG board.
3. If necessary, adjust R11 (+12 V ADJ) of the REG board to obtain +12.3 V.

5.2.2 Unregulated DC power supply

1. Use a digital voltmeter to check for DC 22 V ± 1 V at TP-2 of the REG board.
2. Use a digital voltmeter to check for DC 45 ± 3 V at D10 cathode of the REG board.

5.2.3 Lamps and light emitting diodes (LED)

1. With power on, set for the Stop mode.
2. Observe lighting of power supply pilot lamp, cassette lamp and tape guard LED.
3. Set the channel lock switch to off. Press the channel buttons A through L in sequence and confirm lighting of the channel indicators.
4. Press channel button A and set the channel lock switch to on. In sequence, press channel buttons B through L and confirm that the channel A indicator remains lighted and no change occurs.
5. Set for the REC mode. Confirm that the REC lamp lights.
6. With power on, check that the video lamp lights. Press the video/TV switch once and the video lamp should extinguish; press the switch again and the lamp should light.

5.3 MECHANISM CONTROL CIRCUIT INSPECTION

5.3.1 Operation checks

Insert a cassette and perform the following checks.

1. Press the PLAY key and observe normal tape loading.
2. Press the REW key and check for normal rewind.
3. Press the FF key and check for normal fast forward operation.
4. In the Play mode, press the PAUSE key and confirm that the pause solenoid becomes off.
5. In the Record mode, press the PAUSE key and confirm that the pause solenoid becomes off.
6. In the Play (Record), Slow and FF modes, confirm that the Stop mode becomes obtained when the end of the tape is reached.
7. Confirm that the Stop mode becomes obtained when the beginning of the tape is reached during the REW mode. Also confirm that the REW mode is inoperative at the beginning of the tape.
8. Set the SEARCH switch to COUNTER, then set for the REW mode. Confirm that the Stop mode becomes obtained when the tape counter indication reaches 9998.
9. During the Play (Recording) mode, when the light striking the photo transistor of the TAPE GUARD board is interrupted by the tape (or other opaque material), unloading becomes initiated and the Stop mode obtained.
10. In the Play (Recording) mode, carefully stop the drum rotation by hand. Confirm that unloading becomes initiated and the Stop mode obtained.
11. If REC Pause, Slow or Still mode continues for more than approx. 7 minutes, unloading is performed and Stop mode obtained.
12. With this model, when the power source is interrupted during operaiton, the pause solenoid becomes released. However, the stop solenoid does not operate and when power is again available, operation becomes resumed.

5.3.2 Stop mode initiation

In addition to manual setting (by pressing the STOP key), the stop solenoid operates and the Stop mode becomes initiated when the following sensors function (i.e.: When transistors X3 and P. TR. 1 of the M. CTL board begin conducting).

1. End sensor:
   Functions when the transparent leader section at the end of the tape is reached during Play (Recording), FF and Slow modes.
2. Start sensor:
   Operates when the transparent leader section at the beginning of the tape is reached during the REW mode.
3. Counter search:
   When the SEARCH switch is set to COUNTER during the REW mode, the Stop mode becomes obtained when the tape counter indication reaches 9998.
4. Tape guard:
   Functions when light to the photo transistor of the TAPE GUARD board is interrupted.
5. Drum rotation:
   This functions if the drum rotation becomes impeded during the Play (Recording) mode.
6. Cassette lamp:
   Functions in event of cassette lamp failure.

7. Cue search:
   With the SEARCH switch set to CUE during the REW or FF mode, the Stop mode is obtained at the position the cue signal has been recorded during the REC mode.
8. Cassette switch:
   All modes are inhibited unless the cassette switch is on.

Mode in Progress	Stop Mode Initiating Sensors
Play or Record or Speed	End sensor, tape guard, drum rotation, cassette lamp
Fast Forward (FF)	End sensor, tape guard, cue search, cassette lamp
Rewind (REW)	Start sensor, counter search, tape guard, cue search, cassette lamp
Slow/Still (S/S)/ Pause	End sensor, tape guard, drum rotation, cassette lamp

Table 5-3 Stop mode initiation

5.3.3 Pause solenoid off

The pause solenoid turns off in the following situations.

1. Pause:
   When the PAUSE key is pressed during the Play or Record mode.
2. Remote:
   When the remote control unit is connected and the switch set to PAUSE/STILL (connector terminals open).
3. Camera pause:
   When a video camera is connected in the Recording mode and the start/stop switch of the camera set to STOP.
4. Pause mode configurations

Mode in Progress	PAUSE Lever (Front)	REMOTE (8 pin)	REMOTE PAUSE (Rear)	CAMERA
Play or Audio Dub	Enabled (no picture)	Enabled (Still)	Inhibited	Inhibited
REC (TV mode)	Enabled	Enabled	Enabled	Inhibited
REC (AUX mode)	Enabled	Enabled	Enabled	Enabled

Table 5-4 Pause mode configurations

5.4 CAPSTAN SERVO CIRCUIT CHECKS AND ADJUSTMENTS

5.4.1 Capstan FG (frequency generator) check

1. In the SP Recording mode, connect an oscilloscope to TP-1 (CAP. FG AMP OUT) of the SERVO board.
2. Confirm presence of a 270 Hz sinewave output at more than 1.0 Vp-p. The waveform should also be free from distortion.
3. Check for level fluctuation of less than 2 dB.

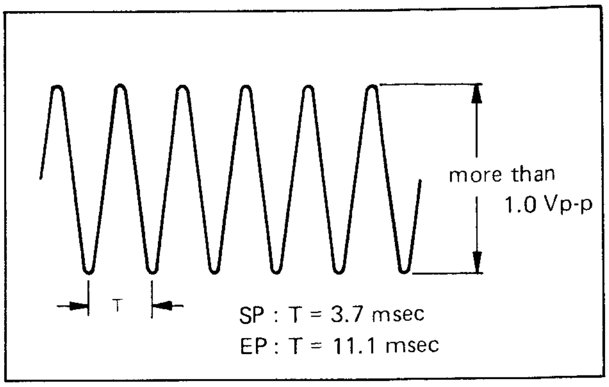


Fig. 5-1 Capstan F.G. Signal

4. In the same manner, set for the EP Recording mode and observe TP-1. With the capstan servo locked, confirm presence of the 90 Hz sine waveform at more than 1.0 Vp-p.

5.4.2 Control pulse polarity

1. Play stairstep segment of the MH-1 alignment tape.
2. Connect oscilloscope to TP-2 (CTL AMP OUT) of the SERVO board.
3. Confirm that T1 is greater than T2 (Fig. 5-2). Perform self-recording and playback, then check again.
4. Play stairstep segment of the MH-1L alignment tape and connect oscilloscope to TP-2.
5. Check that negative level is more than 0.5 V as shown in Fig. 5-2.

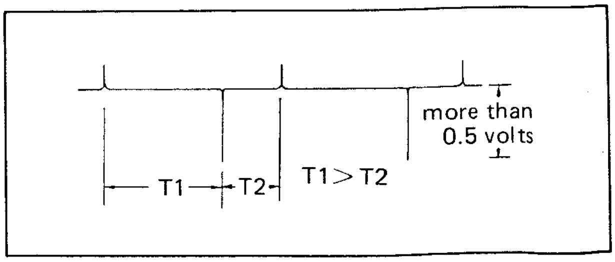


Fig. 5-2 Control signal

5.4.3 Capstan sampling position

1. Play the stairstep segment of the MH-1 alignment tape and set for the Speed mode.
2. Connect digital voltmeter to IC13 pin 3 of the SERVO board.
3. Adjust R123 (1H CAPSTAN SAMPLE POSITION) of the SERVO board to obtain 6.3 V ± 0.1 V.
4. Play the stairstep segment of the MH-1L alignment tape and set for the Normal mode.
5. Measure the DC voltage at IC13 pin 3 and adjust R117 (6H CAPSTAN SAMPLE POSITION) of the SERVO board to obtain 6.3 ± 0.1 V.
6. Use self-recording tape and set for the SP Recording mode. Measure the DC voltage at TP-19 of the SERVO board and adjust R120 (2H CAPSTAN SAMPLE POSITION) of the SERVO board to stabilize the voltage at approx. 7 V .
7. Measure the DC voltage at IC13 pin 3 of the SERVO board and perform fine adjustment of R120 to obtain 6.3 V ± 0.1 V.

5.4.4 Capstan trapezoid

1. Connect oscilloscope to TP-10 (CAPSTAN SAMPLING) of the SERVO board.
2. In succession, set for the Speed and Normal playback and the SP Recording modes and confirm that the sampling pulse is positioned at about the center of the sloping portion of the trapezoidal waveform (see Fig. 5-3).

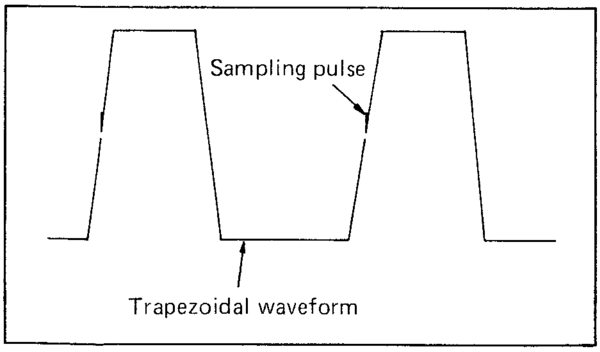


Fig. 5-3 Capstan Sampling Pulse

5.4.5 FG countdown monostable adjustment

1. Supply a video signal input and set for the SP Recording mode.
2. Connect oscilloscope to TP-11 (FG MM OUT) of the SERVO board. Adjust R143 (FG MM) for a 1.85 ± 0.5 msec pulse width.

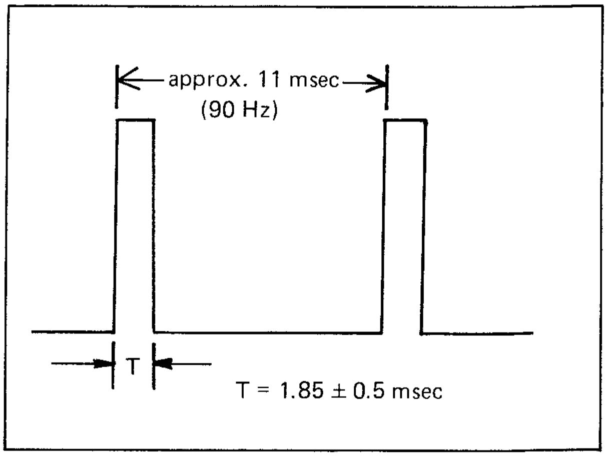


Fig. 5-4 F.G. Count-down monostable

5.4.6 Playback CTL monostable

1. Play the stairstep segment of the MH-1 alignment tape in the Normal mode.
2. Connect oscilloscope to TP-5 of the SERVO board.
3. Adjust R148 (CTL MM) of the SERVO board so that T becomes equal to 5.5 ± 1 msec as shown in Fig. 5-5.
4. Perform self-recording and playback and again confirm.

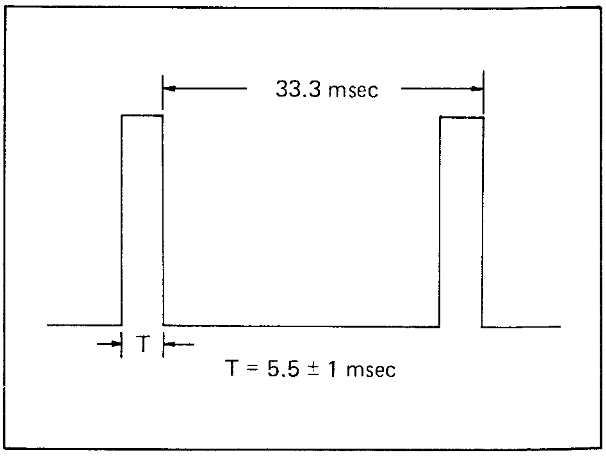


Fig. 5-5 CTL. monostable

5.4.7 Capstan motor input

1. Set for the Normal and Speed Play mode and connect oscilloscope to TP-19 (C. MOTOR IN) of the SERVO board.
2. Confirm a DC level of approx. 7 V and AC ripple of less than 0.6 Vp-p. See Fig. 5-6.
3. Also note absence of abnormal oscillation.

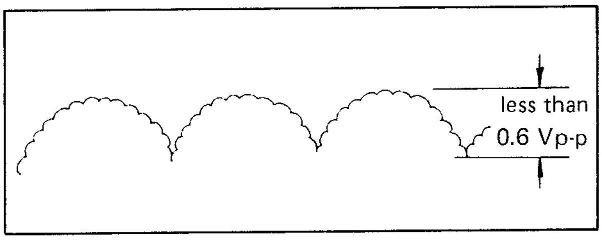


Fig. 5-6 AC ripple

5.4.8 CTL amp noise level

1. Perform recording, then playback in the Still mode.
2. Connect oscilloscope to TP-2 (CTL AMP OUT) of the SERVO board.
3. Check for noise level of less than 50 mVp-p.

5.4.9 Tape speed

1. Play audio 3 kHz segment of the JVC MH-1 alignment tape and connect a frequency counter to TP-1 (AUDIO OUT) of the AUDIO board.
2. Confirm frequency of 3000 Hz ± 0.3% (2991 to 3009 Hz).

5.5 DRUM SERVO CIRCUIT CHECKS AND ADJUSTMENTS

5.5.1 Drum discriminator

1. In the Stop mode, set the power switch (connector panel) to off.
2. Employ an external DC power supply (DC 0.5 V ± 0.05 V). Connect the positive (+) side to TP-14 of the SERVO board and the negative (–) side to TP-17 (or the chassis).
3. Connect the positive (+) side of a digital voltmeter to TP-15 of the SERVO board and the negative (–) side to TP-16.
4. Adjust R83 (DRUM DISCRI) of the SERVO board to obtain a reading of –2.5 ± 0.5 mV.
5. Gently turn the upper drum by hand. After the rotation stops, again confirm this value.

5.5.2 Drum pulse level

1. Set for the SP Recording mode and connect oscilloscope to TP-12 (DRUM PULSE IN) of the SERVO board.
2. After the drum servo has locked, adjust R42 (PULSE LEVEL) of the SERVO board to obtain a negative direction pulse of 1.0 Vp-p. See Fig. 5-7.
3. Check that the positive pulse is 1.0 ± 0.3 Vp-p.

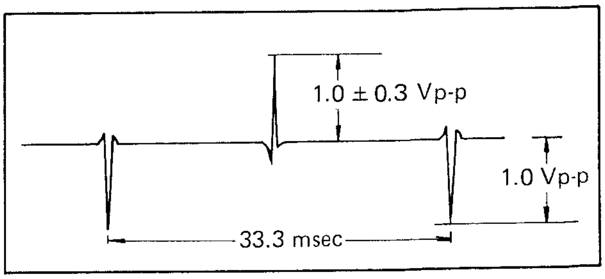


Fig. 5-7 Drum pulse

5.5.3 Drum sampling position

1. Supply a video signal and set for the SP Recording mode.
2. Connect a digital voltmeter to TP-20 of the SERVO board. Adjust R80 (D. SAMPLE POSITION) of the SERVO board to obtain DC +6.2 V ± 0.1 V.

5.5.4 2H-mode playback switching point

1. Play stairstep segment of the JVC MH-1 alignment tape in the normal mode.
2. Trigger the oscilloscope externally using the 30 Hz squarewave from TP-9 (FLIP FLOP OUT) of the SERVO board.
3. Set the slope of the oscilloscope to "–".
4. Connect oscilloscope to TP-18 (V. PULSE OUT) of the SERVO board. Adjust R28 (CH-1 SW PHASE) of the SERVO board to position the trigger point 6.5 ± 0.5 H from V sync. See Fig. 5-8.

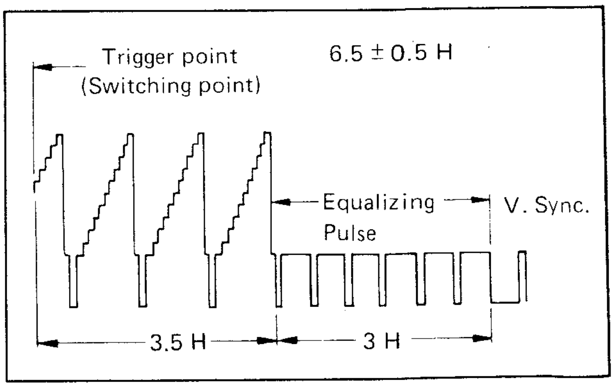


Fig. 5-8 Switching point adjustment

5. Set the oscilloscope slope to "+".
6. Connect the oscilloscope to TP-18 (V. PULSE OUT) of the SERVO board. Adjust R32 (CH-2 SW PHASE) of the SERVO board to position the trigger point 6.5 ± 0.5 H from V. sync.
7. Confirm a difference between CH-1 and CH-2 of within 1 H. Also check the display on a monitor-TV.

5.5.5 Recording switching point

1. Supply a video signal and set for the SP Recording mode.
2. Trigger the oscilloscope externally with the 30 Hz squarewave from TP-9 (FLIP-FLOP OUT) of the SERVO board. Set the slope of the oscilloscope to "–".
3. Connect the oscilloscope to TP-18 (V. PULSE OUT) of the SERVO board. Adjust R62 (REC SW PHASE) of SERVO board to position the trigger point 6.5 ± 0.5 H from V sync. Refer to Fig. 5-8.

5.5.6 6H mode playback switching point

1. Perform only after completing the adjustments of sections 5.5.4 and 5.5.5.
2. Play the stairstep signal of the JVC MH-1L alignment tape in the Normal mode.
3. Trigger the oscilloscope externally with the squarewave from TP-9 (FLIP-FLOP OUT) of the SERVO board.
4. Set the slope of the oscilloscope to "–".
5. Connect the oscilloscope to TP-18 (V. PULSE OUT) of the SERVO board. Adjust R30 (6H CH-1 SW PHASE) of the SERVO board so that the trigger point becomes positioned 6.5 ± 0.5H before V. sync.
6. Supply a video signal and record in the EP mode.
7. Set the oscilloscope slope to "+".
8. Connect the oscilloscope to TP-18 of the SERVO board and adjust R34 (6H CH-2 SW PHASE) to position the trigger point 6.5 ± 0.5H before V. sync. See Fig. 5-8.

5.5.7 REC monostable

1. Supply a video signal and set for the SP Recording mode.
2. Connect oscilloscope to TP-22 (REC MM) of the SERVO board.
3. Adjust R142 (REC MM) of the SERVO board to obtain a pulse width of 5 ± 1 msec (Fig. 5-9).

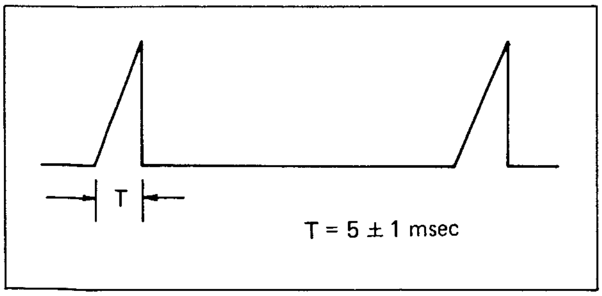


Fig. 5-9 REC monostable

5.5.8 Tracking preset

1. Perform after completing section 5.5.7.
2. Set the TRACKING control of the sub control panel to the center click position.
3. Record in the SP mode, then playback in the Speed mode.
4. While observing the picture display on a monitor, adjust R46 (TRACK PRESET) of the SERVO board for the optimum position of the bar noise (where it cannot be seen).

5.5.9 Drum motor ripple

1. Set for the Recording mode, then press the PAUSE key (REC Pause mode).
2. Connect oscilloscope to TP-16 (D. MOTOR IN) of the SERVO board. Confirm ripple of less than 0.6 Vp-p. See Fig. 5-10.
3. Check for DC voltage of approx. 7 V and confirm absence of abnormal oscillation. See Fig. 5-11.

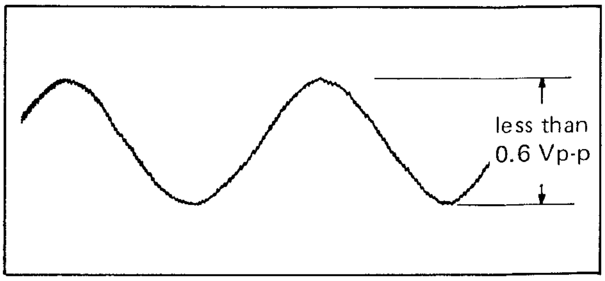


Fig. 5-10 Drum motor ripple

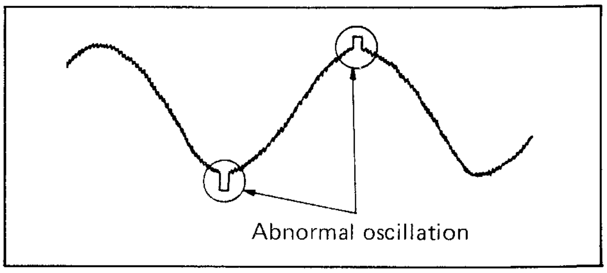


Fig. 5-11 Abnormal oscillation

5.5.10 Slow pulse

1. Perform SP recording, then play back in the Slow mode. Set the sub control panel SLOW SPEED control to center position.
2. Connect oscilloscope to TP-19 (CAP. MOTOR IN) of the SERVO board.
3. Adjust R129 (SLOW PULSE) of the SERVO board for a pulse width of 50 ± 5 msec.

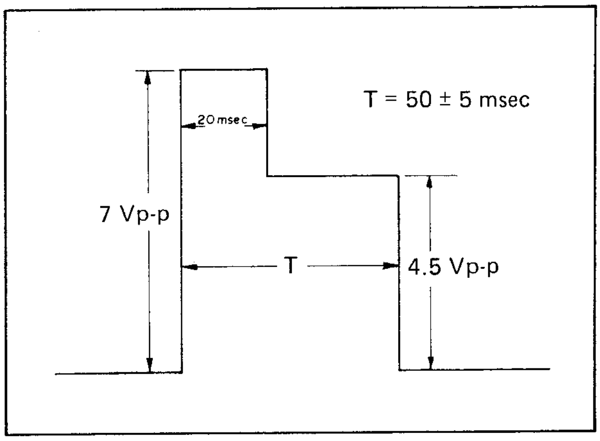


Fig. 5-12 Slow pulse

5.5.11 Slow preset and tape start

1. Perform after completing section 5.5.7.
2. Record in the SP mode, then playback in the Slow mode.
3. Set the Slow tracking control of the sub control panel to the center click position, then turn the Slow speed control for minimum speed.
4. When tape running is stopped, observe the TV image. Adjust R49 (SLOW PRESET) of the SERVO board for optimum bar noise position.
5. Turn the Slow speed control to maximum. While the tape is running, adjust R106 (TAPE START) of the SERVO board for optimum bar noise position.
6. Vary the Slow speed control from minimum to maximum. Fine adjust R49 and R106 for optimum bar noise position.

NOTES:

- *Connect oscilloscope to IC10 pin 16 of the SERVO board and confirm monostable width of more than 20 msec. If less, again adjust R106 to obtain more than 20 msec. (See Fig. 5-13.)*
- *In event the above steps do not eliminate the bar noise, vary the width (T = 50 msec) indicated in section 5.5.10 within the range of ±5 msec, then re-adjust R49 and R106.*

> ***IMPORTANT:***
> *During the EP (6H) mode, bar noise position in Slow, Still and Speed operations is not specified.*

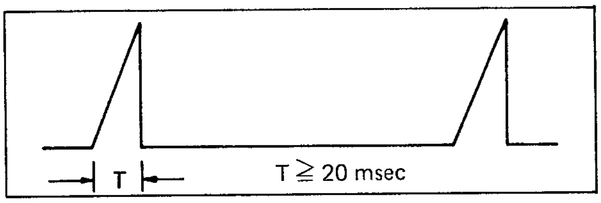


Fig. 5-13 Tape start monostable

5.5.12 Control (AUDIO/CTL) head position

> ***IMPORTANT:***
> *Ordinarily, do not perform this adjustment. It is required only after replacing the Audio/CTL head and/or the video heads.*

1. Play the stairstep signal of the JVC MH-1 alignment tape and set the Slow Tracking control to the center click position.
2. In the Slow playback mode, set the Slow Speed control to minimum.
3. Observe the TV image and while the tape running is stopped, loosen 2 screws Ⓓ (Fig. 5-14) and adjust the A/C head position to just eliminate the bar noise. After adjusting, tighten the screws and apply a small amount of (hobbyist) glue to secure them.

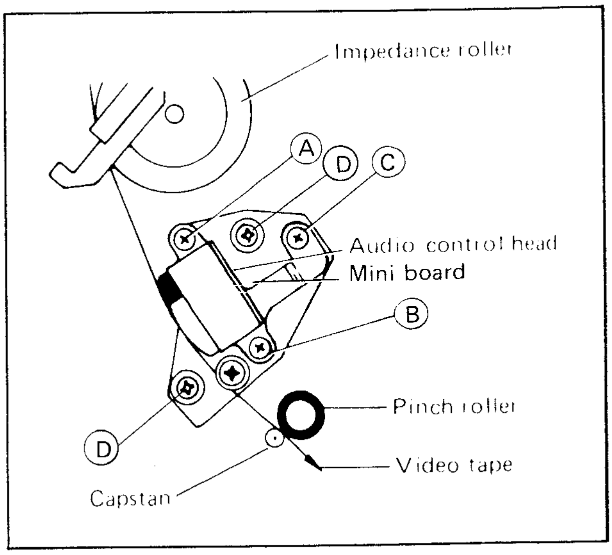


Fig. 5-14 A/C head position

5.5.13 6H STD tape

1. Play the stairstep segment of the MH-1L (6H) alignment tape.
2. Set the sub control panel TRACKING control to the center (click) position.
3. Connect oscilloscope to TP-5 (FM OUT) of the PRE/REC board.
4. Adjust R58 (6H STD TAPE) of the SERVO board for maximum channel-1 FM waveform level.

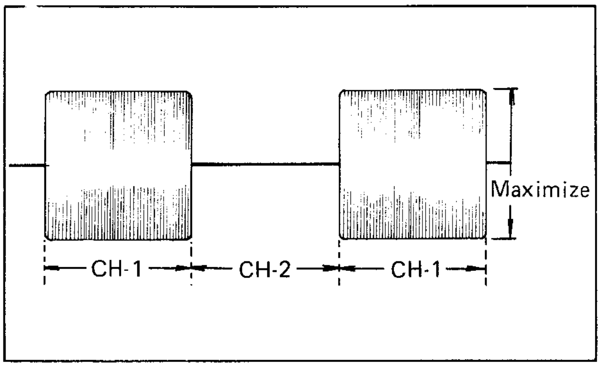


Fig. 5-15 6H STD tape adjustment

5.5.14 6H REC monostable

1. Play stairstep segment of the MH-1L (6H) alignment tape in the Normal mode.
2. Connect CH-1 of a dual-trace oscilloscope to TP-9 (FLIP FLOP OUT) of the SERVO board and CH-2 to TP-2 (CTL AMP OUT).
3. Read and make a memo of the phase difference between the positive pulses at TP-9 and TP-2 (T_1 in Fig. 5-16).

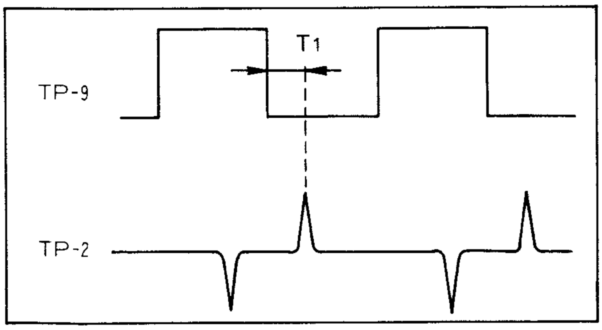


Fig. 5-16 6H monostable

4. Record in the EP (6H) mode.
5. Connect CH-1 of the oscilloscope to TP-9 (FLIP FLOP OUT) and CH-2 to connector 21 of the SERVO board.
6. So that the phase difference between the signals at TP-9 and connector 21 (T_2 in Fig. 5-17) becomes equal to T_1, adjust R54 (6H REC MM) of the SERVO board.

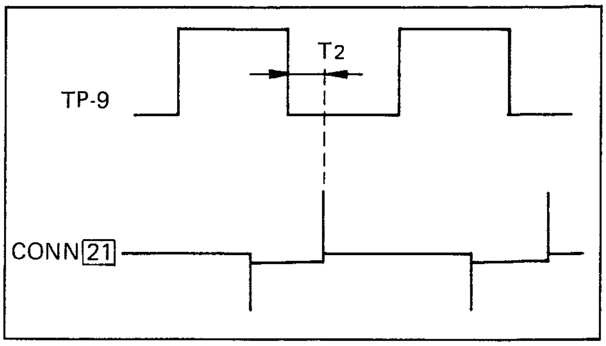


Fig. 5-17 6H REC monostable

5.5.15 6H speed tracking

1. Perform only after completing the steps of sections 5.5.13 and 5.5.14.
2. Record in the EP (6H) mode and playback in the Speed mode.
3. Set the sub control panel TRACKING control to the center (click) position. While observing the picture display, adjust R59 (6H SPEED TRACK) of the SERVO board to minimize bar noise.

5.5.16 V. pulse

1. Supply a video signal. Perform SP (2H) recording and playback in the Still mode.
2. Trigger the oscilloscope externally with the signal from TP-9 (FF OUT) of the SERVO board.
3. Connect the oscilloscope to TP-18 (V. PULSE OUT) of the SERVO board. Alternate the oscilloscope slope between "+" and "–" and adjust R103 (CH-1 V. PULSE) of the SERVO board so that the difference in the pulse falling position becomes 100 ± 20 µsec. See Fig. 5-18.
4. Check that the V. pulse width is 300 ± 100 µsec.
5. Confirm that the V. pulse is present during the Slow and Still modes and absent during the normal Play mode.

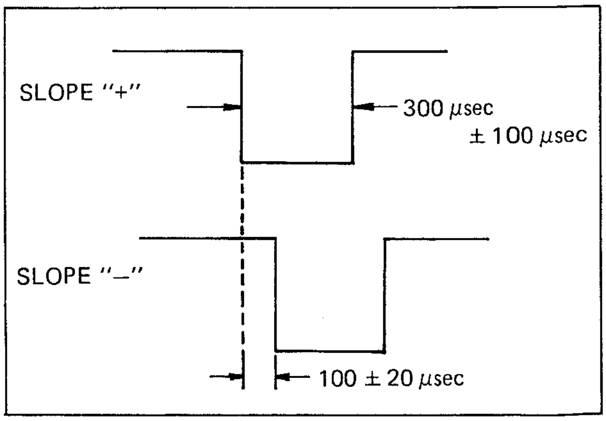


Fig. 5-18 V. Pulse Adjustment

Note: *Adjustment without instruments*

If the monitor-TV or TV receiver which the user normally employs with this machine is available, the following adjustment can be performed.

1. Carefully adjust the V. HOLD and H. HOLD controls of the monitor-TV or TV receiver.
2. Perform SP (2H) mode recording and playback in the Still mode.
3. While observing the picture display, adjust R103 (V. LOCK) of the SERVO board to minimize (or eliminate) vertical instability. This control is accessible through the rear cover as shown in Fig. 5-19.

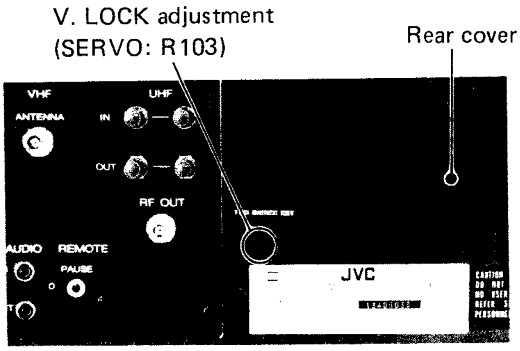

V. LOCK adjustment
(SERVO: R103)
Rear cover
VHF
UHF
ANTENNA
IN
OUT
RF OUT
AUDIO
REMOTE
PAUSE
JVC

Fig. 5-19 V. LOCK adjustment

5.5.17 Playback 2H monostable

1. Play stairstep segment of the MH-1 alignment tape in the Normal mode.
2. Connect oscilloscope to TP-4 of the SERVO board.
3. Confirm a pulse width of 2 ± 1 msec (Fig. 5-20).

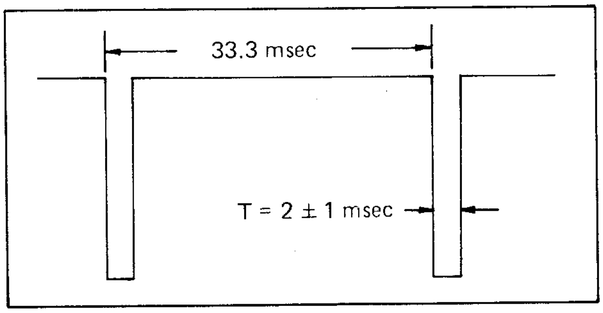

33.3 msec
T = 2 ± 1 msec

Fig. 5-20 Playback 2H monostable

5.5.18 Drum trapezoidal waveform

1. Perform recording, then playback. Connect oscilloscope to TP-8 (DRUM SAMPLING) of the SERVO board.
2. During normal playback, confirm approx. 5 msec inclination of the trapezoidal waveform.
3. During Slow and Still modes, confirm inclination of approx. 15 msec.
4. In the REC Pause mode, confirm inclination of approx. 5 msec.

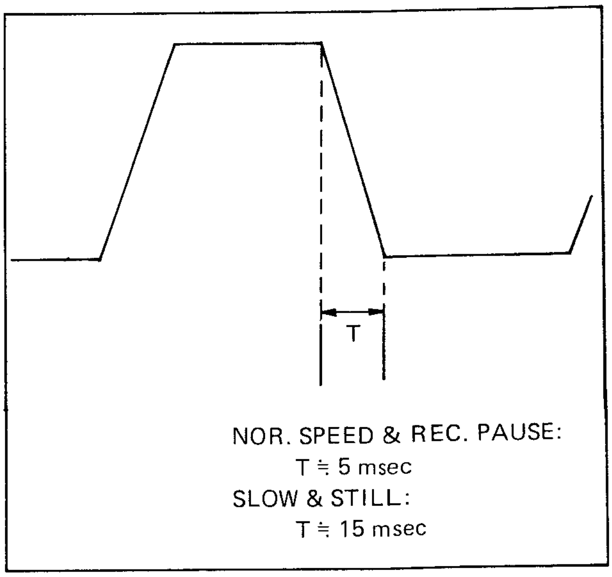

T
NOR. SPEED & REC. PAUSE:
T ≒ 5 msec
SLOW & STILL:
T ≒ 15 msec

Fig. 5-21 Drum trapezoidal waveform

5.6 LUMINANCE PLAYBACK SYSTEM CHECKS AND ADJUSTMENTS

5.6.1 Video head resonance and Q

NOTE:

This adjustment is required only after replacing the upper drum (video heads).

1. Play the RF sweep signal segment of the JVC MH-1 alignment tape in the Normal mode.
2. Connect oscilloscope to TP-5 (PB FM OUT) of the PRE/REC board.
3. Adjust C27 (SP F2) of the PRE/REC board to set the CH-2 resonance point to 4.2 MHz. See Fig. 5-22.

   NOTE: *In this mode, the MH-1 marker appears at 4.5 MHz.*
   However, adjust for 4.2 MHz.

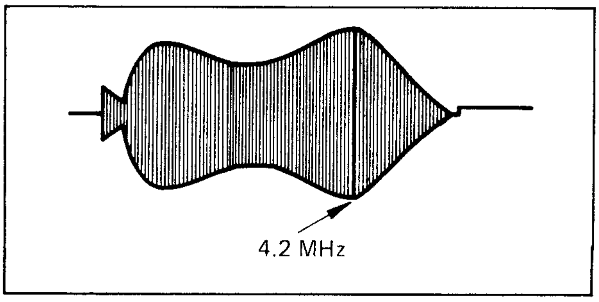


Fig. 5-22 RF sweep (MH-1)

4. Turn R41 (SP Q2) of the PRE/REC board fully clockwise (as viewed from the pattern side of the board).
5. Adjust C26 (SP F1) of the PRE/REC board to position the CH-1 resonance point at 4.2 MHz.
6. So that the CH-1 4.2 MHz level becomes as close as possible to the CH-2 4.2 MHz level, adjust R40 (SP Q1).
7. Play the RF sweep segment of the JVC MH-1L (6H) alignment tape in the Normal mode.
8. Connect oscilloscope to TP-5 (FM OUT) of the PRE/REC board.
9. Adjust C33 (EP F2) of the PRE/REC board to position the CH-2 resonance point at the 4.2 MHz marker. Turn R47 (EP Q2) to maximum (fully clockwise). See Fig. 5-23.
10. Adjust C32 (EP F1) of the PRE/REC board to position the CH-1 resonance point at the 4.2 MHz marker.
11. Adjust R46 (EP Q1) so that the CH-1 marker portion is nearly the same as that of CH-2.
12. Record a video signal in the SP (2H) and EP (6H) modes, then playback both in the Normal mode. Confirm absence of flicker and black-white reversal in the reproduced picture. If necessary, carefully readjust R40, R41, R46 and R47.

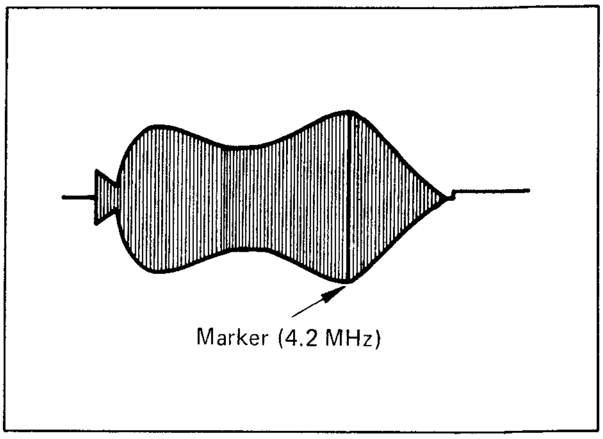


Fig. 5-23 RF sweep (MH-1L)

5.6.2 FM channel balance

1. Play color bar segment of the JVC MH-1 alignment tape and connect oscilloscope to TP-5 (FM OUT) of the PRE/REC board.
2. Confirm a difference in FM level between CH-1 and CH-2 of less than 3 dB.
3. Record and playback a color bar signal and again check.
4. Repeat the above steps using the MH-1L (6H) alignment tape.

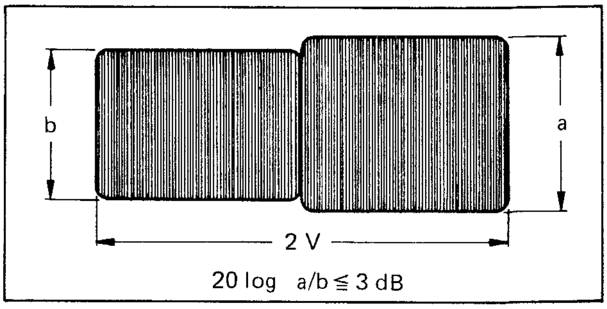


Fig. 5-24 Playback FM

5.6.3 Limiter balance

1. Play color bar segment of the JVC MH-1 alignment tape and connect oscilloscope to TP-18 (DEMOD. OUT) of the Y & COLOR board.
2. Adjust R63 (LIMITER BALANCE) of the Y & COLOR board to obtain general overlapping from the sync tip to white peak. See Fig. 5-25.

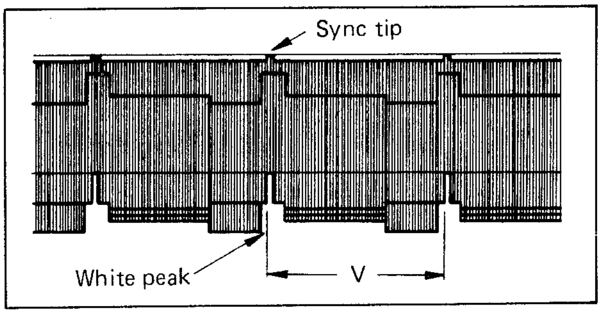


Fig. 5-25 Demodulator

5.6.4 Playback video output

1. Play color bar segment of the JVC MH-1 alignment tape and connect oscilloscope to the VIDEO OUT terminal or TP-6 (VIDEO OUT) of the Y & COLOR board. Terminate the signal at 75 Ω.
2. Adjust R49 (PB Y LEVEL) of the Y & COLOR board for a video signal level of 0.95 ± 0.1 Vp-p.
3. Observe the display on a monitor-TV and confirm normal luminance signal.

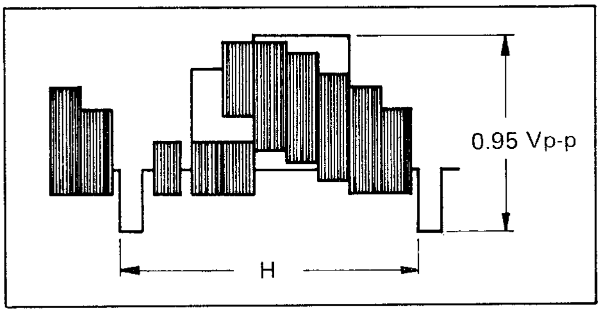


Fig. 5-26 Playback Y level

5.7 LUMINANCE SIGNAL RECORDING SYSTEM CHECKS AND ADJUSTMENTS

5.7.1 Carrier set and deviation

> ***IMPORTANT:***
> *Ordinarily avoid performing this adjustment. It should be performed only if IC1 of the Y & COLOR board has been replaced or if significant waveform distortion and S/N deterioration occur during recording and playback due to deficient adjustment of the carrier set and deviation.*

1. Connect a regulated DC power supply (0 to 15 V) between TP-2 (PRE EMPHA OUT) of the Y & COLOR board and ground.
2. Connect a frequency counter to TP-4 (FM MOD OUT) of the Y & COLOR board.
3. Without an input signal, set for the E-E mode. Connect oscilloscope to TP-2 of the Y & COLOR board to monitor the DC voltage. See connection diagram of Fig. 5-27.

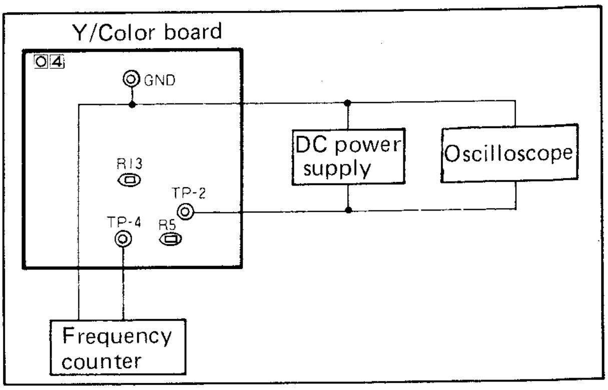


Fig. 5-27 Connection diagram

4. Adjust the voltage of the power supply to where the frequency counter indicates 3.4 MHz. This becomes voltage Ⓐ in Fig. 5-28 (about 7.75 V as measured at TP-2).
5. Adjust the voltage of the power supply to where the frequency counter indicates 4.4 MHz. This becomes voltage Ⓑ (about 9.97 V as measured at TP-2).

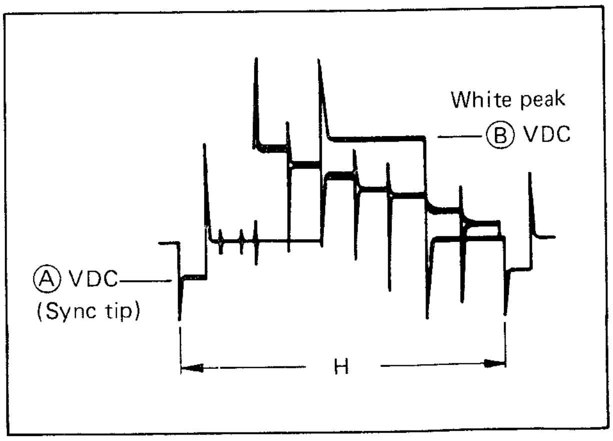
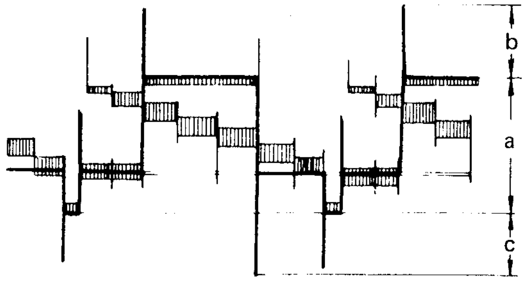


Fig. 5-28 Carrier and deviation adjustments

6. Disconnect the power supply and frequency counter. Supply a color bar signal and set for the E-E mode.
7. Monitor the voltage at TP-2 with the oscilloscope and adjust R5 (CARRIER) of the Y & COLOR board to obtain a voltage equal to Ⓐ.
8. In the same condition, adjust R13 (DEVIATION) of the Y & COLOR board to obtain a voltage equal to Ⓑ.

5.7.2 White clip and dark clip

1. Supply a color bar signal and set for the E-E mode.
2. Connect oscilloscope to TP-1 of the Y & COLOR board.
3. With the rated signal level taken as 100%, adjust R12 (WHITE CLIP) of the Y & COLOR board so that the white peak overshoot becomes 70% to 80%.
4. In the same condition, adjust R11 (DARK CLIP) so that the sync tip undershoot becomes 35% to 45%. See Fig. 5-29.



WHITE CLIP a : b = 100 : 70–80
DARK CLIP a : c = 100 : 35–45

Fig. 5-29 White and dark clip adjustment

5.7.3 Carrier balance

> ***IMPORTANT:***
> *Ordinarily avoid this adjustment. Perform it only if the carrier set and deviation adjustment of section 5.7.1 has been necessary and completed.*

1. Supply color bar signal and set for the E-E mode.
2. Connect oscilloscope to TP-4 (FM MOD OUT) of the Y & COLOR board.
3. Adjust R4 (CARRIER BALANCE) of the Y & COLOR board so that the modulation waveform becomes symmetrical with respect to the center, while its level is miminum.

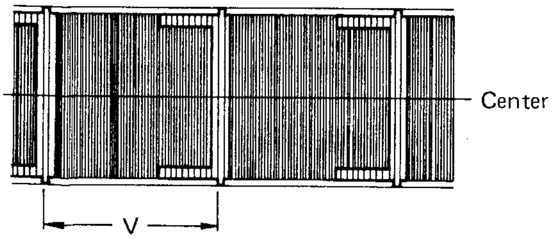


Fig. 5-30 Carrier balance

5.7.4 E-E output level

1. Supply color bar signal and set for the E-E mode.
2. Connect oscilloscope to the VIDEO OUT terminal or TP-6 of the Y & COLOR board. (terminate at 75 Ω).
3. Adjust R30 (EE LEVEL) of the Y & COLOR board for a video output level of 0.95 ± 0.1 Vp-p.
4. Observe the display on a color monitor and check for normal color reproduction.

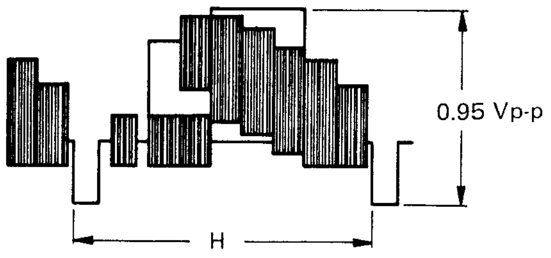
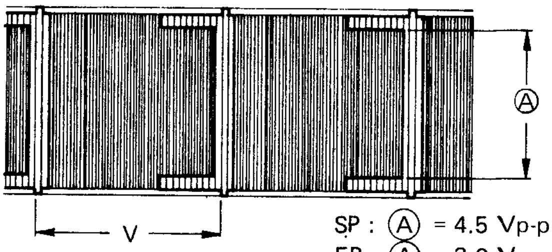


Fig. 5-31 E-E video output

5.7.5 FM recording level

1. Supply color bar signal and set for the SP Recording mode.
2. Connect oscilloscope to TP-1 (REC AMP OUT) of the PRE/REC board.
3. Adjust R2 (SP. REC FM) of the PRE/REC board so that the color bar white component of the FM waveform becomes 4.5 Vp-p. See Fig. 5-32.
4. Set for the EP (6H) recording mode. Adjust R5 (EP REC FM) of the PRE/REC board so that the level of the FM waveform white component becomes 3.0 Vp-p as measured at TP-1.



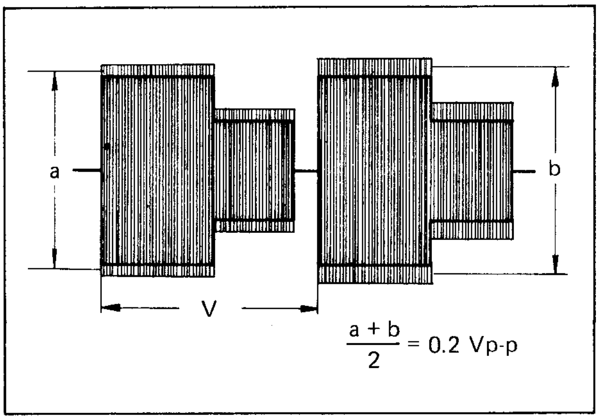
SP : Ⓐ = 4.5 Vp-p
EP : Ⓐ = 3.0 Vp-p

Fig. 5-32 FM recording level

5.8 COLOR PLAYBACK SYSTEM CHECKS AND ADJUSTMENTS

5.8.1 Color preamp output

1. Play color bar segment of the JVC MH-1 alignment tape and connect oscilloscope to TP-7 (PB COLOR OUT) of the PRE/REC board.
2. Adjust the TRACKING control for minimum beat and maximum level. The level is measured at the center of the crosstalk component.
3. Adjust R65 (SP. PB COLOR LEVEL) of the PRE/REC board so that the average level of CH-1 and CH-2 becomes 0.2 Vp-p.
   Confirm channel difference within 3 dB.



$$\frac{a+b}{2} = 0.2\ \text{Vp-p}$$

Fig. 5-33 Color preamp output

4. Play the color bar segment of the JVC MH-1L (6H) alignment tape in the Normal mode. Adjust R66 (EP PB COLOR LEVEL) of the PRE/REC board so that the average level of CH-1 and CH-2 becomes 0.2 Vp-p as measured at TP-7.

***Note**: The 2H (SP) mode must have priority.*

5.8.2 Playback 3.58 MHz crystal oscillator

1. Set for the Play mode and connect a frequency counter to TP-16 (3.58 MHz OSC) of the Y & COLOR board.
2. Adjust C122 (PB 3.58 MHz) of the Y & COLOR board to obtain 3.579545 MHz ± 50 Hz.

5.8.3 Converter balance

1. Play color bar segment of the JVC MH-1 alignment tape and connect oscilloscope to TP-10 of the Y & COLOR board.
2. Adjust R101 (CONVERTER BALANCE) for minimum leakage of the 4.2 MHz component.

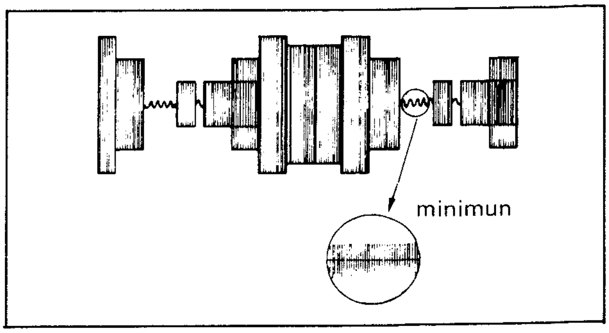


Fig. 5-34 Converter balance adjustment

5.8.4 Playback color output level

1. Play color bar segment of the JVC MH-1 alignment tape and connect oscilloscope to the VIDEO OUT terminal or TP-6 of the Y & COLOR board (terminate at 75 Ω).
2. Adjust R109 (PB COLOR LEVEL) of the Y & COLOR board for a burst level of 0.25 ± 0.05 Vp-p.

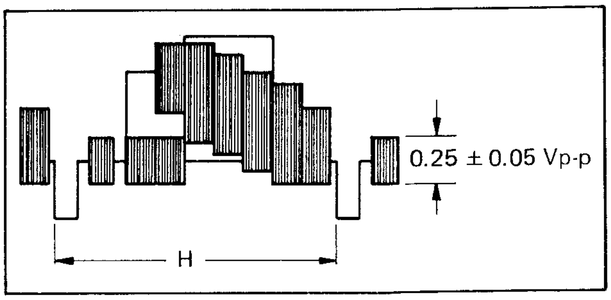


Fig. 5-35 Playback color level

5.9 COLOR RECORDING SYSTEM CHECKS AND ADJUSTMENTS

5.9.1 AFC (automatic frequency control) and VXO (variable crystal oscillator)

1. Supply a color bar singal and set for the E-E mode.
2. Connect a 100 μF/16 V electrolytic capacitor between TP-14 of the Y & COLOR board and ground.
3. Connect a frequency counter to TP-15 of the Y & COLOR board and adjust R145 (AFC) of the Y & COLOR board to obtain 15.734 kHz ±50 Hz.
4. Remove the capacitor (above step 2) and connect it between TP-11 of the Y & COLOR board and ground.
5. Connect frequency counter to TP-13 of the Y & COLOR board and adjust R135 (VXO) of the Y & COLOR board to obtain 3.579545 MHz ±50 Hz. Afterwards, remove the capacitor.

5.9.2 Color recording level and channel balance

1. Record a color bar signal in the SP mode and playback in the Normal mode. Connect oscilloscope to TP-7 (PB COLOR OUT) of the PRE/REC board.
2. During recording, adjust R25 (SP. REC. COLOR BALANCE) so that the CH-1 and CH-2 color output levels become the same during playback.
3. In the same condition, during recording, adjust R7 (SP. REC COLOR) of the PRE/REC board so that average level of CH-1 and CH-2 becomes 0.2 Vp-p during playback.
4. Repeat the above steps 2 and 3 several times. It is also acceptable to adjust R7 and R25 during recording for the same level obtained in the adjustment of section 5.8.1.

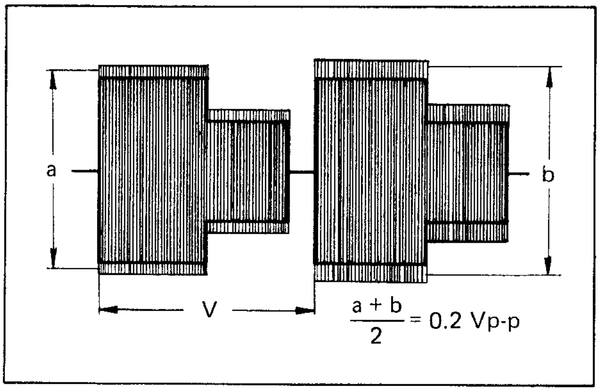


Fig. 5-36 Color preamp output

5. Record a color bar signal in the EP (6H) mode and playback in the Normal mode. Connect oscilloscope to TP-7 of the PRE/REC board. Adjust R23 (EP REC COLOR BALANCE) to obtain equal levels of CH-1 and CH-2, then R9 (EP REC COLOR) so that the average levels of CH-1 and CH-2 become 0.2 Vp-p. Perform adjustment during recording and check during playback. Repeat this adjustment two or three times.

5.10 AUDIO CIRCUIT CHECKS AND ADJUSTMENTS

5.10.1 EE level

1. Supply a 1 kHz 0.22 Vp-p (−20 dB) audio signal to the AUDIO INPUT terminal and set for the E-E (Stop) mode.
2. Connect oscilloscope to the audio output terminal. Adjust R69 (EE LEVEL) of the AUDIO board for a level of 1.1 Vp-p (−6 ± 0.5 dB).

5.10.2 Voice control oscillator

1. Set for the E-E (Stop) mode.
2. Connect oscilloscope to TP-5 of the VC board.
3. Adjust R24 (OSC ADJ) of the VC board to obtain a pulse width of 21 ± 1 μsec. See Fig. 5-37. Also confirm an approx. 50% waveform duty.

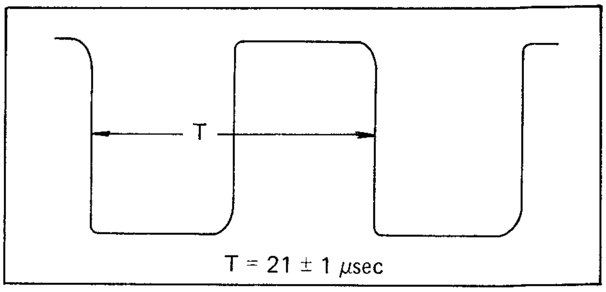


Fig. 5-37 Osc. adjustment

5.10.3 BBD balance

1. Supply a 1 kHz −20 dB (0.22 Vp-p) signal to the audio input terminal and set for the E-E mode.
2. Connect oscilloscope to TP-3 the VC board. Adjust R7 (BIAS ADJ) of the VC board to eliminate waveform distortion.
3. Without an input signal, alternately adjust R10 (BALANCE-A) and R11 (BALANCE-B) of the VC board to minimize clock noise (ⓐ in Fig. 5-38) as measured at TP-3.
4. Adjust R14 (BALANCE ADJ) of the VC board to minimize switching level difference (ⓑ in Fig. 5-38) as measured at TP-3.
5. After adjustment, check that component ⓒ (Fig. 5-38) is equal or less than 10 mVp-p.

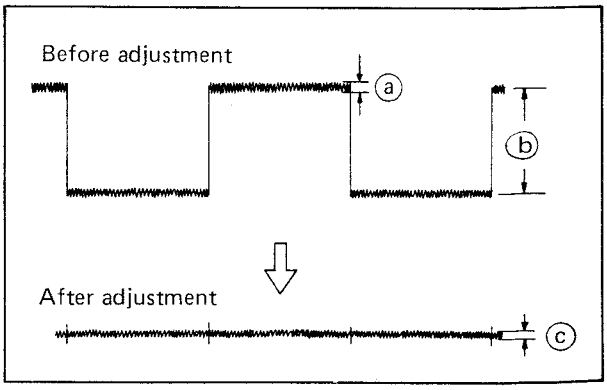


Fig. 5-38 BBD balance

5.10.4 Bias level

1. Set for the recording mode and connect oscilloscope to TP-6 (AUDIO HEAD IN) of the AUDIO board.

2. Adjust R111 (BIAS LEVEL) of the AUDIO board to obtain 60 Vp-p.
3. If playback signal waveform is distorted, increase the level to approx. 70 Vp-p.

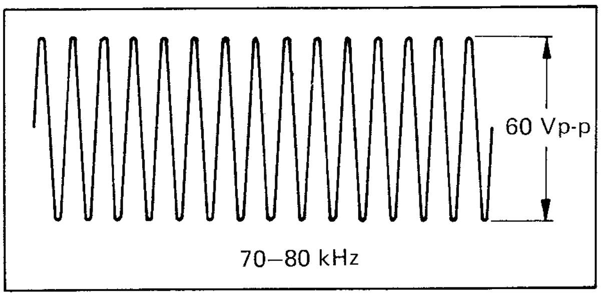


Fig. 5-39 Bias level

5.10.5 Playback level

1. Play the color bar segment of the JVC MH-1 alignment tape in the Normal mode.
2. Connect oscilloscope to the audio output terminal. Adjust R79 (PB LEVEL) of the AUDIO board to obtain a level of 1.1 Vp-p (−6 dB ± 0.5 dB).

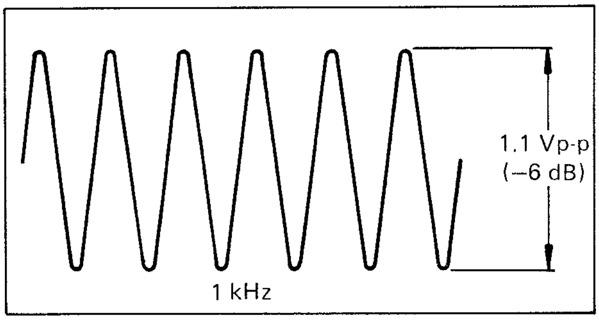


Fig. 5-40 Playback audio output

5.10.6 BBD bias level

1. Play the color bar segment of the JVC MH-1 alignment tape in the Speed mode.
2. Connect oscilloscope to TP-4 of the VC board.
3. Confirm absence of waveform distortion.
4. If distortion is present, carefully adjust R7 (BIAS ADJ) of the VC board.

5.10.7 Recording level

1. Supply a 1 kHz 0.22 Vp-p (−20 dB) audio signal to the AUDIO INPUT terminal. Record in the SP mode and playback in the Normal mode.
2. During playback, connect oscilloscope to the audio output terminal. So that the level during playback becomes 1.1 Vp-p (−6 ± 1 dB), adjust R8 (REC LEVEL) of the AUDIO board during recording.
3. Repeat this adjustment 2 or 3 times (i.e.: adjust during recording and check during playback). Also confirm absence of waveform distortion.

5.10.8 Recording equalizer

1. In sequence, supply audio signals of 1 kHz, 100 Hz and 7 kHz at 0.07 Vp-p (−30 dB) to the AUDIO INPUT terminal. Record these signals in the SP mode and playback in the Normal mode.
2. During recording, adjust R26 (REC EQ) of the AUDIO board so that during playback, with the 1 kHz signal taken as reference, the 100 Hz and 7 kHz signals become within ±3 dB.
3. Repeat this adjustment 2 or 3 times (i.e.: adjust during recording and check during playback).

5.10.9 Bias leak

1. Without an audio input, set for the Recording mode.
2. Connect oscilloscope to the audio output terminal and confirm bias leak of less than 0.07 Vp-p (−30 dB).
3. Set for the Audio Dub mode and again check for −30 dB.
4. If leak is greater than −30 dB, adjust L1 of the AUDIO board.

5.11 TIMING PHASE BOARD ADJUSTMENTS

Perform the following steps only after completing mechanical adjustments. Also, in the REC Pause mode, confirm 0.4 mm spacing between the pinch roller and capstan shaft.

5.11.1 Stop timing

1. Connect a 2.2 kΩ resistor between TP-2 and TP-3 of the MECHA CTL board.
2. Short the plus (+) side of C64 of the SERVO board to ground. Set the TRACKING control of the sub control panel to the center click position.
3. Trigger the oscilloscope externally with the signal from TP-9 (FF OUT) of the SERVO board.
4. Turn R9 and R10 of the TIMING PHASE board fully counter-clockwise (as viewed from the front of the deck).
5. Insert a 30 minute cassette (T-30), record (SP mode) and playback a color bar signal.
6. Connect oscilloscope to TP-5 (FM OUT) of the PRE/REC board. Adjust R9 (STOP TIMING) of the TIMING PHASE board so that when the

PAUSE key is pressed during the Play mode, the minimum component of the FM output (noise position) becomes located at the center (within ±5 msec) of the CH-2 FM waveform. See Fig. 5-41.

7. Remove the resistor of step 1 and the short of step 2.

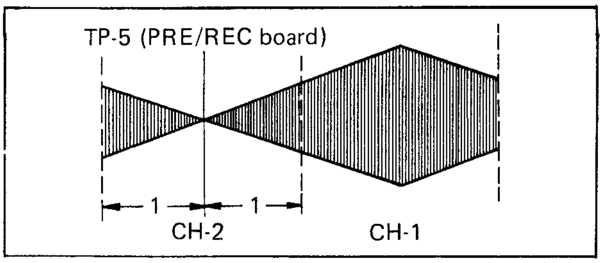


Fig. 5-41 Stop timing

5.11.2 Start timing

1. Supply a video signal and perform recording (SP mode) and playback.
2. Connect a 2.2 kΩ resistor between TP-2 and TP-3 of the MECHA CTL board.
3. Short the plus (+) side of C64 of the SERVO board to ground. Set the TRACKING control of the sub control panel to the center click position.
4. Trigger the oscilloscope externally with the signal from TP-9 (FF OUT) of the SERVO board. Set the slope of the oscilloscope to "+".
5. During playback, connect the oscilloscope to TP-3 of the SERVO board.
6. Observe the CTL signal timing when the servo is fully locked. When the PAUSE key is pressed, then released (pressed again), so that the position of the first CTL signal becomes the same (within ±2 msec), adjust R10 (START TIMING) of the TIMING PHASE board. See Fig. 5-42.
7. Repeat this adjustment several times. Also, be sure to press the PAUSE key after the servo is fully locked.

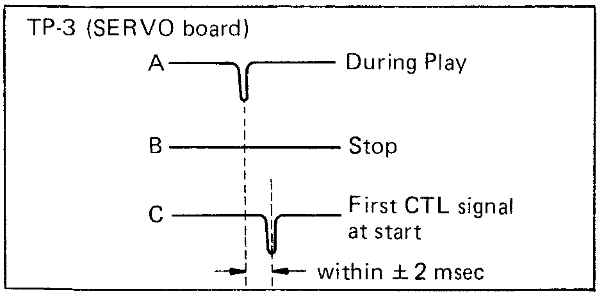


Fig. 5-42 Start timing

8. Remove the resistor of step 2 and the short of step 3.

Note:

Use T-120 tape and record intermittantly in the SP mode (about 5 times). During playback, check that the control pulse is within ± 2 msec. Also confirm absence of FM signal loss between recorded segments.

Performance in the EP mode cannot be guaranteed.

5.12 PROGRAMMABLE TIMER

5.12.1 Important precautions

This programmable timer incorporates a built-in microcomputer. Programming of the memory is therefore performed by correct sequential operation of the control buttons.

If the timer is subjected to an externally produced unusually strong pulse type noise or electrostatic discharge, one or more of the following malfunctions may occur.

1. Erasing of the memory.
2. Defective indications of portions of the display or complete absence of indications.
3. Operating buttons become inoperative.

In event of the above conditions, perform the checks described in sections 5.12.2 to 5.12.5. Afterwards, set the main power switch (rear cover) to off and wait at least 60 minutes or disconnect connector P10 of the TIMER board. Again supply power and confirm that all operations and displays are functioning normally.

After performing the checks, if normal operation is not returned, inspect the timer and display circuits for defective components.

5.12.2 DC voltage checks

Use a digital voltmeter to confirm the following voltages of the TIMER board. Perform with the DISPLAY board connected.

1. DC 22 V ± 3.6 V at P5-56 . . . . Operation mode
   DC 25 V ± 3.6 V at P5-56 . . . . . Stand-by mode
2. DC4.9 V to 5.2 V at P6-62
3. DC –32 V to –34 V at P6-63
4. DC –28 V to –30 V at D4 anode

5.12.3 400 kHz clock

1. Connect a frequency counter to IC1 pin 1 of the TIMER board.
2. Check for oscillator frequency of 400 kHz ± 10 kHz.
3. If necessary, carefully adjust by turning the core of T2.

Note:

Use care to avoid misreading due to capacitance of the test probe.

5.12.4 1 Hz oscillator

1. Connect a frequency counter to the TIMER board TP-1 (X7 emitter).
2. Confirm oscillator frequency of 4,194,304 Hz ±5 Hz.

3. If necessary, carefully adjust C17 of the TIMER board.

Note:
Use care to avoid misreading due to capacitance of the test probe.

5.12.5 Reset pulse generator

1. Connect oscilloscope to IC2 pin 4.
2. Confirm that the reset pulse is produced when IC1 pin 21 (Vdd) changes from DC 3.4 V to DC 5.0 V.
3. Conversely, confirm that the pulse is not produced when Vdd changes from DC 3.6 V to DC 5.0 V.
4. If adjustment is required, perform according to the following steps.
5. Remove the BACKUP board and connect as shown in Fig. 5-43.

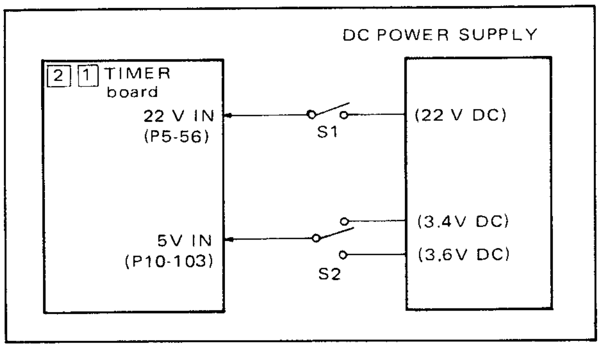


Fig. 5-43

6. Turn R8 fully counter-clockwise.
7. Set S1 to off, S2 to 3.4 VDC position and connect oscilloscope to IC2 pin 4.
8. Confirm that pin 4 is high (approx. 3.4 V DC) at this time. Gradually turn R8 to where the pin becomes low (approx. 0 V).
9. Set S1 to on and confirm that reset pulse is produced. See Fig. 5-44.
10. Set S2 to the 3.6 VDC position. Set S1 to off, then to on and confirm that the reset pulse is not obtained. If it appears, carefully readjust R8.

5.13 TIMER OPERATION CHECKS

Refer to Controls and Connectors of section 1.5, 1.8 and 1.15.

5.13.1 Power interruption and return

1. Disconnect the AC cord from the AC outlet for one hour, then reinsert it. Confirm that all digits flash at 1 second intervals. The display should read SUN (Sunday) 88 : 88 00 (88 hours, 88 minutes, 00 seconds). See Fig. 5-45.

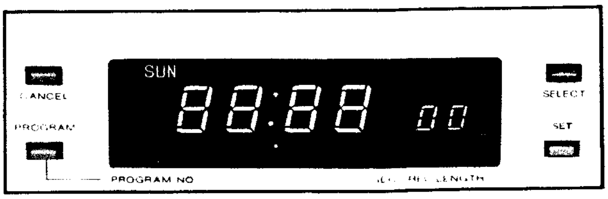


Fig. 5-45

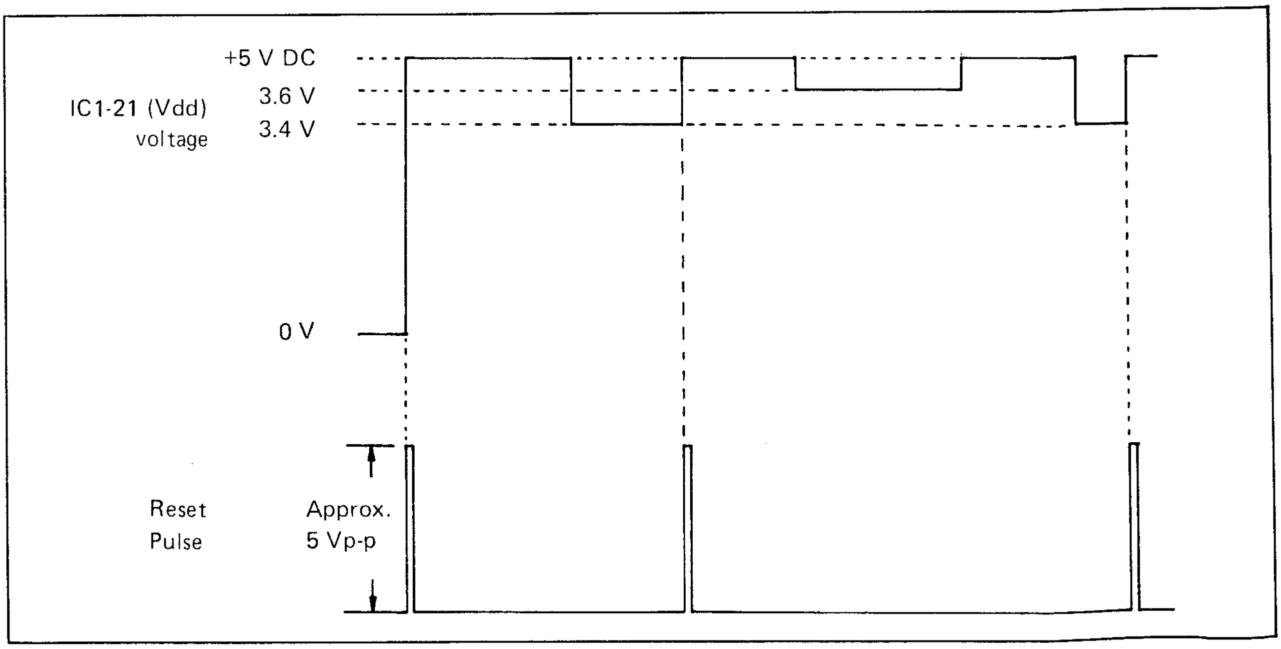


Fig. 5-44 Reset pulse

2. Press the SELECT, SET, PROGRAM and CANCEL buttons. Confirm that no change occurs in the display.

5.13.2 Timer setting

1. Set the display function select switch to CLOCK SET.
2. The seconds digits flash and counting begins. Press the SET button and confirm reset to zero. Be sure to perform the following steps in the sequence given.
3. Press the SELECT button; the minutes digits will flash. Then press the SET button to advance the digits; hold the button depressed for rapid advance.
4. Again press the SELECT button; the hours digits will flash. Press the SET button to advance the hours digits; hold the button depressed for rapid advance.
5. Press the SELECT button a third time; the day indication will flash. Press the SET button to advance the day; hold the button depressed for rapid advance.

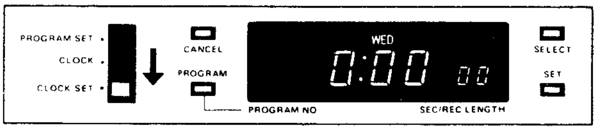

PROGRAM SET
CLOCK
CLOCK SET
CANCEL
PROGRAM
WED
0:00 00
SELECT
SET
PROGRAM NO
SEC/REC LENGTH

Fig. 5-46

5.13.3 Program setting

1. Set the display function switch to PROGRAM SET. Be sure to perform the following steps in the sequence given.

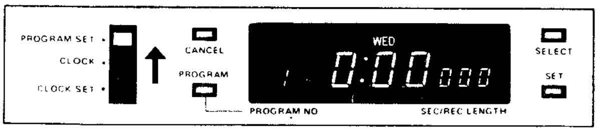

PROGRAM SET
CLOCK
CLOCK SET
CANCEL
PROGRAM
WED
0:00 000
SELECT
SET
PROGRAM NO
SEC/REC LENGTH

Fig. 5-47

2. Observe that the CHANNEL SETTING indicator flashes. Press the SET button to advance the indication; hold the button depressed for rapid advance.

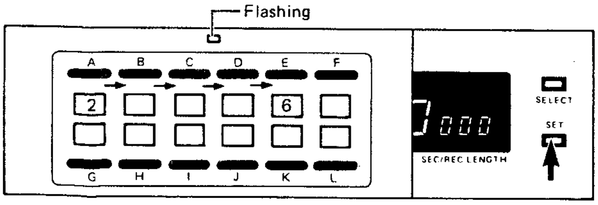

Flashing
A
B
C
D
E
F
2
6
G
H
I
J
K
L
SELECT
SET
SEC/REC LENGTH

Fig. 5-48

3. Press the SELECT button; the day indication will flash. Advance the display by pressing the SET button; hold the button depressed for rapid advance.

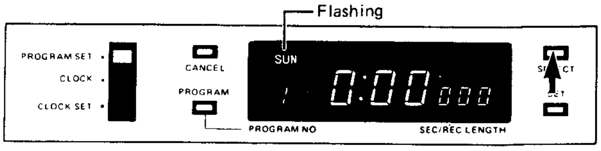

Flashing
PROGRAM SET
CLOCK
CLOCK SET
CANCEL
PROGRAM
SUN
0:00 000
SELECT
SET
PROGRAM NO
SEC/REC LENGTH

Fig. 5-49

4. Again press the SELECT button; the hours indication will flash. Use the SET button to advance the hours digits.

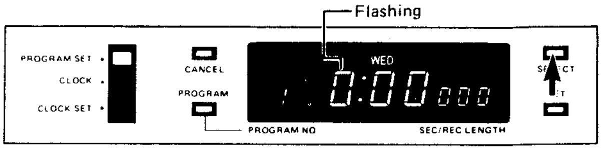

Flashing
PROGRAM SET
CLOCK
CLOCK SET
CANCEL
PROGRAM
WED
0:00 000
SELECT
SET
PROGRAM NO
SEC/REC LENGTH

Fig. 5-50

5. Press the SELECT button a third time; the minutes digits will flash. Use the SET button to advance the minutes digits.

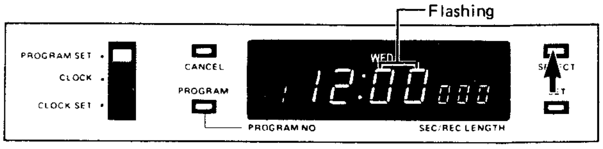

Flashing
PROGRAM SET
CLOCK
CLOCK SET
CANCEL
PROGRAM
WED
12:00 000
SELECT
SET
PROGRAM NO
SEC/REC LENGTH

Fig. 5-51

6. The fourth time the SELECT button is pressed, the REC LENGTH digits flash. Use the SET button to advance the display in 5 minute steps; hold the button depressed for rapid advance.

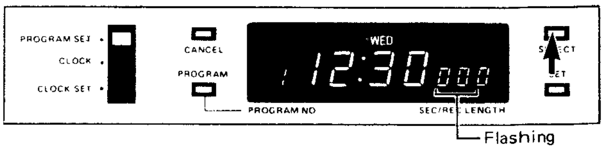

PROGRAM SET
CLOCK
CLOCK SET
CANCEL
PROGRAM
WED
12:30 000
SELECT
SET
PROGRAM NO
SEC/REC LENGTH
Flashing

Fig. 5-52

5.13.4 Cancel

Press the CANCEL button to erase the contents of the program indicated by the PROGRAM NO. indicator.

5.13.5 All cancel

Simultaneously press the PROGRAM and CANCEL buttons to erase all programs.

5.13.6 REC length entry omission

If the REC LENGTH (recording length in minutes) of a program (1 to 6) is not entered and the PROGRAM button advanced, the other contents of that memory station become erased (reset). For example, if all the data for program 3 are entered except for REC LENGTH, and the PROGRAM button advanced to program 4, the program 3 data become erased.

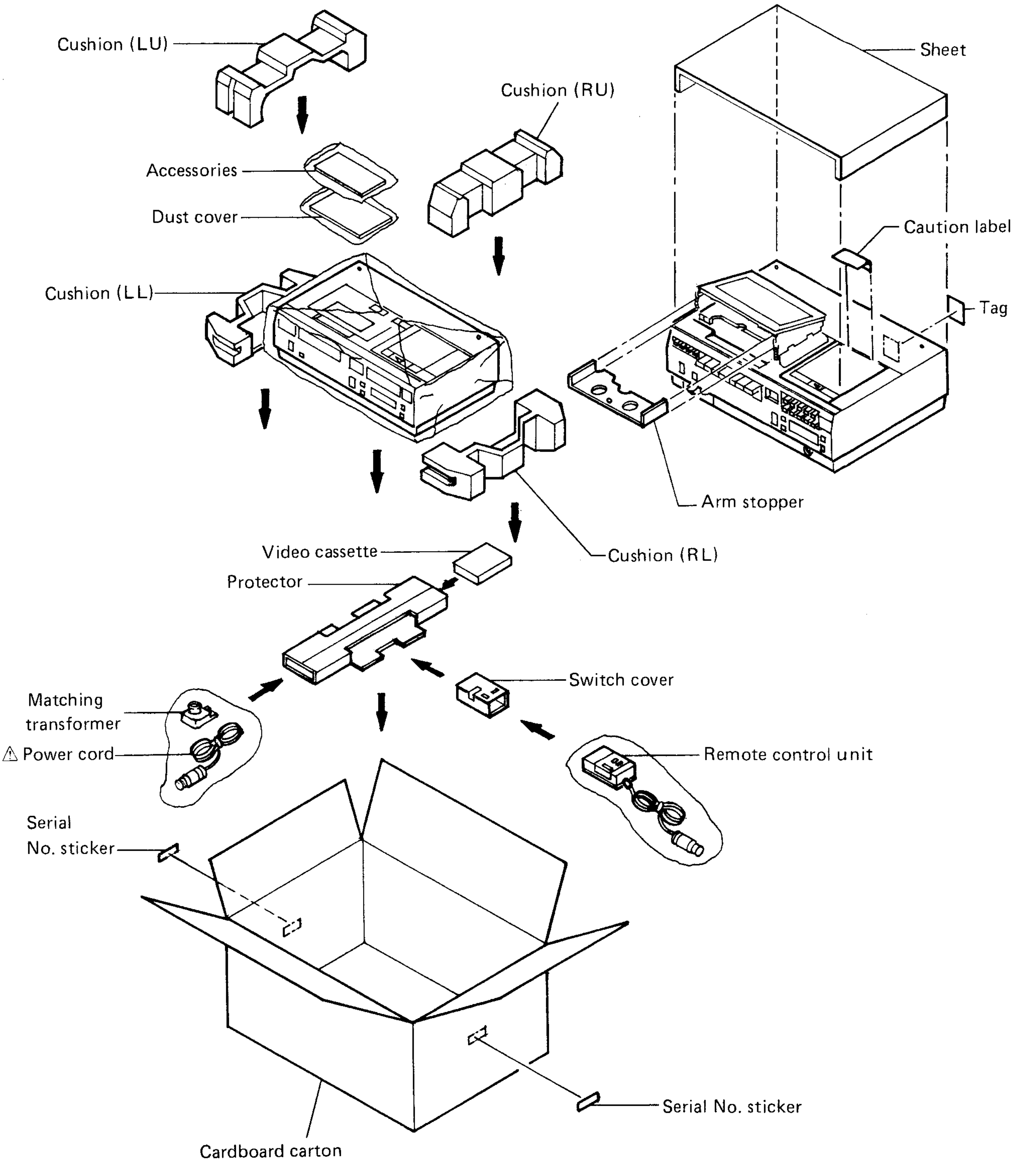
5.13.7 One-shot and serial settings

Programs 1, 2 and 3 are one-shot, i.e.: after the entered program has been recorded, the memory contents become erased. Programs 4, 5 and 6 are serial and the contents of each memory remain intact after the selected program has been recorded.

5.13.8 Back up circuit

After the machine has been connected to AC power for longer than 1 hour, briefly set the power switch (rear cover) to off, then to on. Confirm that reset is not performed and operations remain normal.

SECTION 6
REPACKING


Cushion (LU)
Cushion (RU)
Sheet
Accessories
Dust cover
Caution label
Tag
Cushion (LL)
Arm stopper
Video cassette
Cushion (RL)
Protector
Switch cover
Matching transformer
⚠ Power cord
Remote control unit
Serial No. sticker
Serial No. sticker
Cardboard carton

Note: *Parts identified by the ⚠ symbol are critical for safety.*
Replace only with specified part numbers.
For maximum reliability and performance, all other replacement parts should be identical to those specified.

SECTION 7
EXPLODED VIEWS AND PARTS LIST

7.1 EXPLODED VIEWS AND MAIN PARTS LIST 7-3

7.2 MAIN DECK-1 .... (M1) 7-4

7.3 MAIN DECK-2 .... (M2) 7-10

7.4 DRUM ASSEMBLY .... (M3) 7-14

7.5 CASSETTE HOUSING ASSEMBLY .... (M4) 7-15

7.6 FUNCTION ASSEMBLY .... (M5) 7-16

7.7 SWITCH BOX ASSEMBLY .... (M6) 7-17

7.8 CONTROL BOX ASSEMBLY .... (M7) 7-17

7.9 TUNER UNIT ASSEMBLY .... (M8) 7-18

7.10 CHASSIS ASSEMBLY .... (M9) 7-20

7.11 DISPLAY ASSEMBLY .... (MA) 7-21

7.12 CABINET ASSEMBLY .... (MB) 7-22

7.13 REMOTE CONTROL UNIT .... (MC) 7-24

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

In these exploded views the part numbers of the screws and washers refer to shape. The following examples illustrate the coding system.

Examples:

SPSP3006ZS
"ISO" metric screw thread
Length in mm (6mm)
Diameter in mm (3mm)
Cross-recrossed, pan head screw

LPSP3014ZS
Length: 14mm
Diameter: 3mm
Cross-recrossed, pan head screw with lock washer

DPSP4008ZS
Diameter: 4 mm
Cross-recrossed, pan head screw with lock washer and plain washer

SSSP3008ZS
Cross-recrossed, flat countersunk head screw

SDBP3006NS
Cross-recrossed, binding head screw

YRS3004FS
Hexagon socket set screw with sunken tip

YFS3006FS
Hexagon socket screw with flat tip

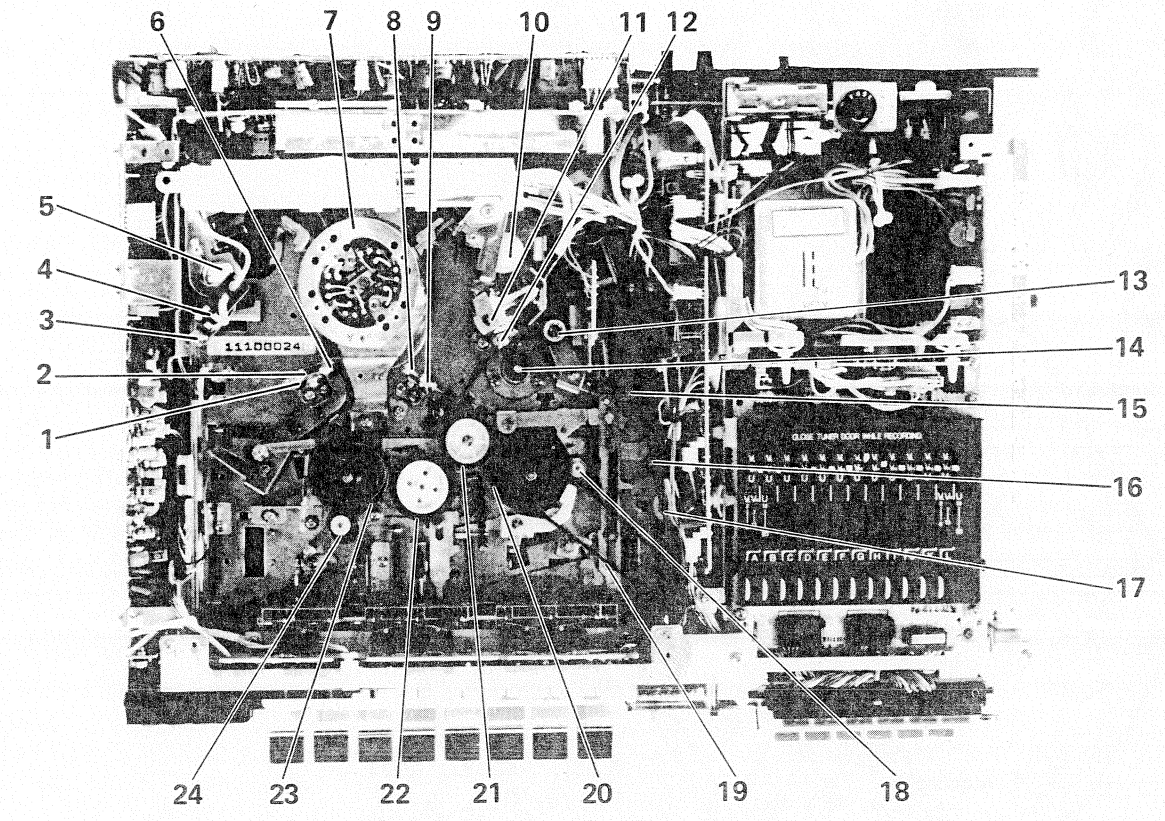
BYS3006FS
Hexagon socket head bolt

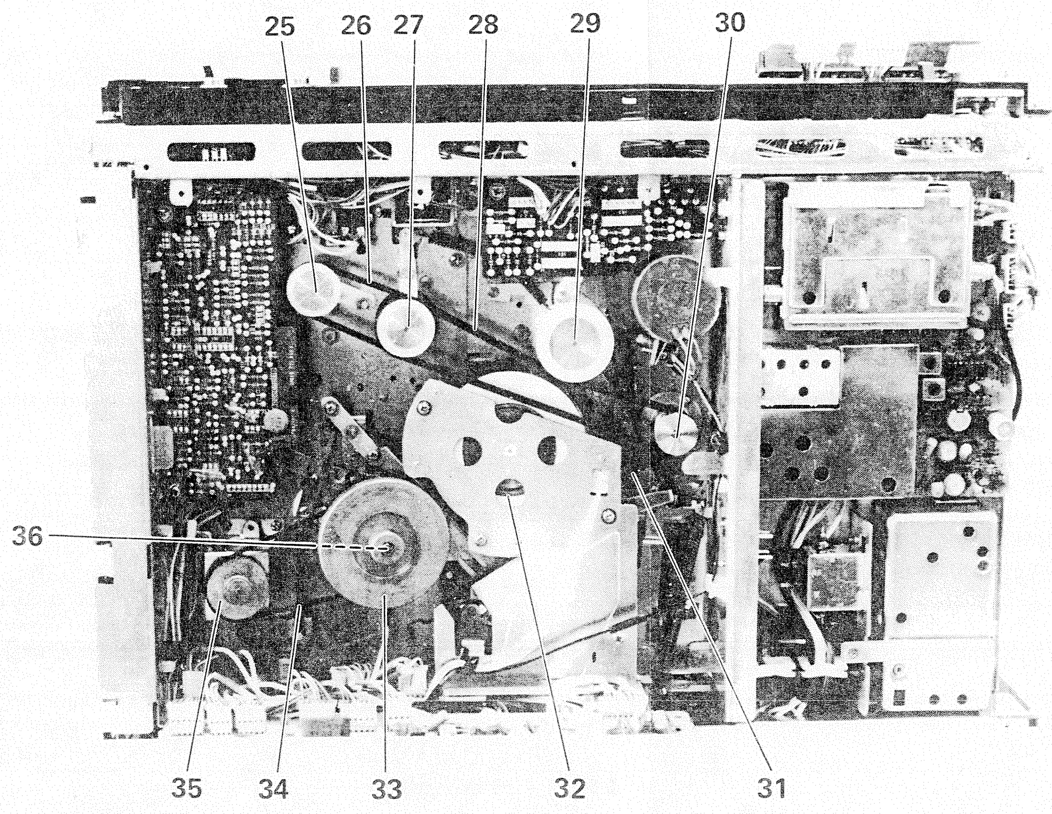
WLS3000
Diameter of the applicable screw (3 mm screw)
Lock washer

WNS3000Z
Plain metal washer

REE4000
Diameter of the stud slot.
Retaining ring ("E" type)

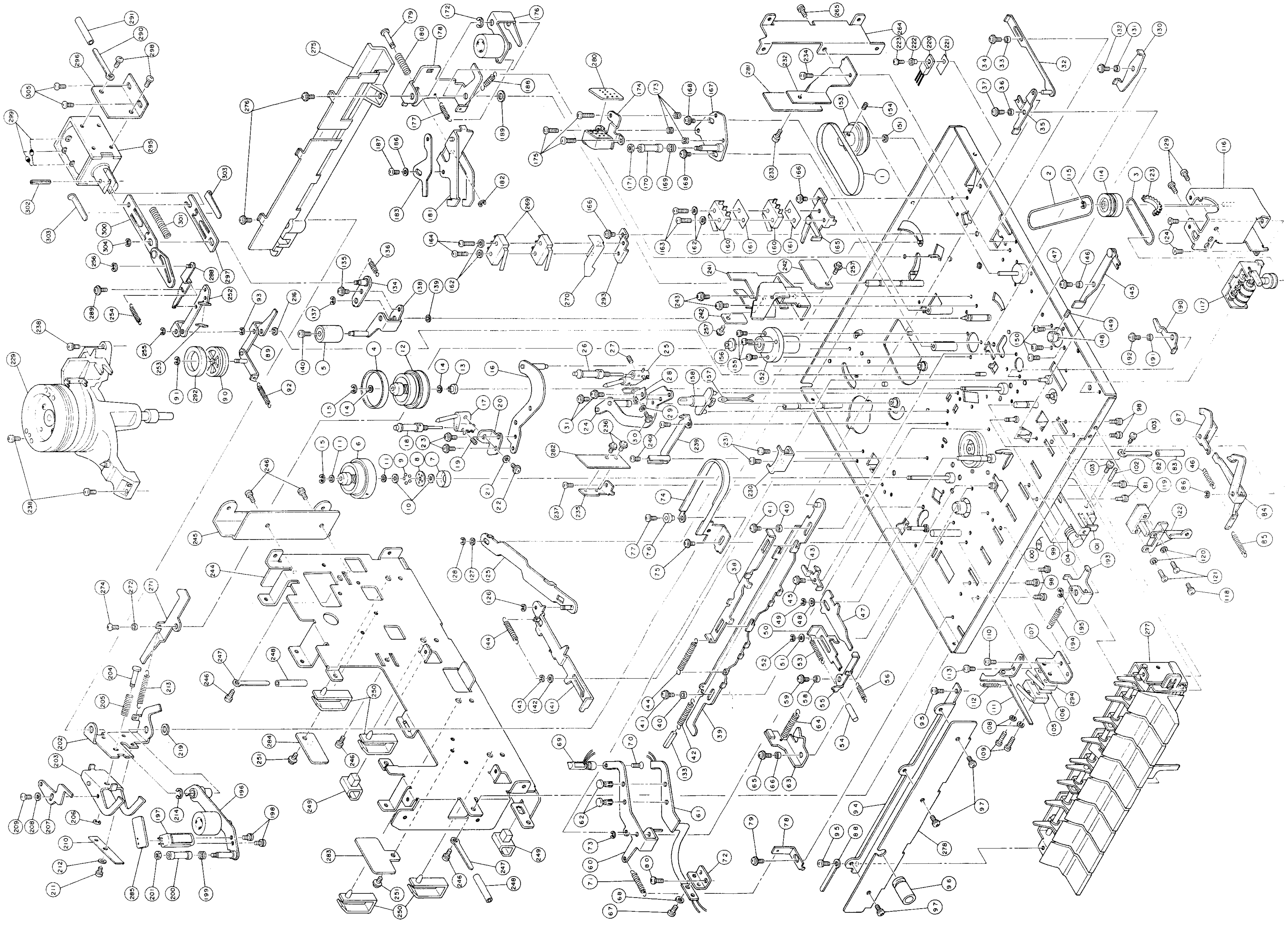
7.1 EXPLODED VIEWS AND MAIN PARTS LIST





1. Supply guide roller
2. Supply (slanted) pole
3. Supply guide pole
4. Full erase head
5. Supply impedance roller
6. Supply tension pole (Cue head)
7. Upper drum ass'y (Video heads)
8. Take-up (slanted) pole
9. Take-up guide roller
10. Take-up impedance roller
11. Audio/control head and audio erase head
12. Take-up guide pole
13. Pinch roller
14. Capstan shaft
15. Relay pulley (A)
16. Relay belt
17. Capstan motor pulley
18. Take-up idler side face
19. Counter belt (1)
20. Take-up reel disk side face (rubber tire)
21. F.F. pulley (rubber tire)
22. REW idler side face (rubber tire)
23. Supply reel disk side face
24. Unloading idler side face (rubber tire)
25. Unloading idler
26. Unloading belt
27. REW idler
28. Reel drive belt
29. Take-up idler
30. Relay pulley (B)
31. Capstan belt
32. Capstan flywheel
33. Drum pulley
34. Drum belt
35. Drum motor pulley
36. Brushes and slipring (for electrostatic noise)

7.2 MAIN DECK-1 M1



Symbol No.	Part No.	Part Name	Remarks
1	PU44912	Capstan Motor Belt	
2	PU44863	Counter Belt-1	
3	PU44863-2	Counter Belt-2	
4	PU44918	Take-up Reel Disc Rubber Tire	
5	PU47549A	Pinch Roller Ass'y	
6	PU44922A	Supply Reel Disc Ass'y	
7	PU44919	Bearing Holder	
8	PU44920	Retainer	
9	PU41135-3	Steel Ball	
10	PU44921	Spacer	
11	Q03093-834	Washer	0.13 thick for adjusting reel disc height
	" -827	"	0.25 thick "
	" -828	"	0.5 thick "
12	PU44913A	Take-up Reel Disc Ass'y	
13	PU45789	Collar	
14	Q03093-834	Washer	0.13 thick for adjusting reel disc height
	" -827	"	0.25 thick "
	" -828	"	0.5 thick "
15	REE2000	"E" Ring	
16	PU44982A	Supply Loading Arm Sub Ass'y	
17	PU44949B	Supply Slant Pole Base Ass'y	
18	PU44952B	Guide Roller Ass'y	
19	YFS3004BS	Set Screw	
20	PU44957	Holder Bracket (Supply)	
21	T30302-025	Collar	
22	DPSP3008ZS	Screw	
23	DPSP3005ZS	"	
24	PU44979A	Take-up Loading Arm Sub Ass'y	
25	PU44958B	Take-up Slant Pole Base Ass'y	
26	PU44952B	Guide Roller Ass'y	
27	YFS3004BS	Set Screw	
28	PU44960	Holder Bracket (Take-up)	
29	T30302-025	Collar	
30	DPSP3008ZS	Screw	
31	DPSP3005ZS	Screw	
32	PU47719A	Connecting Plate Ass'y	
33	T30302-008	Collar	
34	DPSP3006ZS	Screw	
35	PU47721	Connecting Lever	
36	T30302-004	Collar	
37	DPSP3007ZS	Screw	
38	PU47941	Charged Lever	
39	PU47940A	Memory Plate Ass'y	
40	T30302-005	Collar	
41	DPSP3005ZS	Screw	
42	PU35005-48	Spring	
43	PU44826	Safty Plate	
44	T30300-27	Spring	
45	PU46732	Flange Screw	
46	PU35005-28	Spring	
47	PU46479-2	Off Lever	
48	Q03093-502	Washer	
49	REE3000	"E" Ring	
50	PU44845	REW Lever	

Symbol No.	Part No.	Part Name	Remarks
51	Q03093-430	Washer	
52	REE2500	"E" Ring	
53	T30300-109	Spring	
54	QXT658H-010	Vinyl Tube	
55	PU44846-2	Idler Off Lever	
56	T30300-11	Spring	
57	–	–	
58	T30302-004	Collar	
59	DPSP3006ZS	Screw	
60	PUS46107A	Tension Arm Ass'y	Incl: (71) Spring
61	PU32263-1-2	Cue Head Circuit Board	REF: $\boxed{3}\boxed{6}$
62	E48729-001	Plastic Rivet	
63	PUS46090A	Supply Loading Tension Lever Ass'y	Incl: Brake Shoe (PU42199) and (64) Spring
64	PU35005-106	Spring	
65	DPSP3006ZS	Screw	
66	PU43769-31	Collar	
67	SPSP3006ZS	Screw	
68	Q03093-115	Washer	
69	PU47944	Cue Head	
70	SSSP2606Z	Screw	
71	PU35005-107	Spring	
72	PU48007	Board Bracket	
73	REE2500	"E" Ring	
74	PUS45904A	Tension Band Ass'y	
75	DPSP3006ZS	Screw	
76	PU44859	Washer	
77	SPSP2006Z	Screw	
78	PU44823	Bracket	
79	DPSP3006ZS	Screw	
80	LPSP3006ZS	Screw	
81	DPSP3006ZS	Screw	for STOP Solenoid Bracket
82	55234	Wire Clamp	
83	QXT3320-025	Tube	
84	PU47887-2	Take-up Brake Lever	
85	T30300-49	Spring	
86	REE2500	"E" Ring	
87	PUS46132A	Take-up Loading Brake Ass'y	Incl: Cushion (PU45673)
88	55234	Wire Clamp	
89	PU44833C	F.F. Arm Ass'y	
90	PU47279	F.F. Idler	
91	REE2500	"E" Ring	
92	PU35005-28	Spring	
93	REE3000	"E" Ring	
94	PU31688-1-1	Operation Board Bracket	
95	LPSP3006ZS	Screw	
96	PU46633	Lamp Bushing	for Recording Indicator
97	LPSP3006ZS	Screw	for (278) OPE. Board
98	LPSP3006ZS	"	for Function Ass'y
99	PU44623-4	STOP Solenoid	
100	V03C	Diode	
101	PU47924-1-4	Solenoid Bracket	
102	PRE3028	Spring Pin	
103	LPSP3005ZS	Screw	
104	PU49145	Spring	
105	QSM1S01-014	Microswitch	Cassette Switch

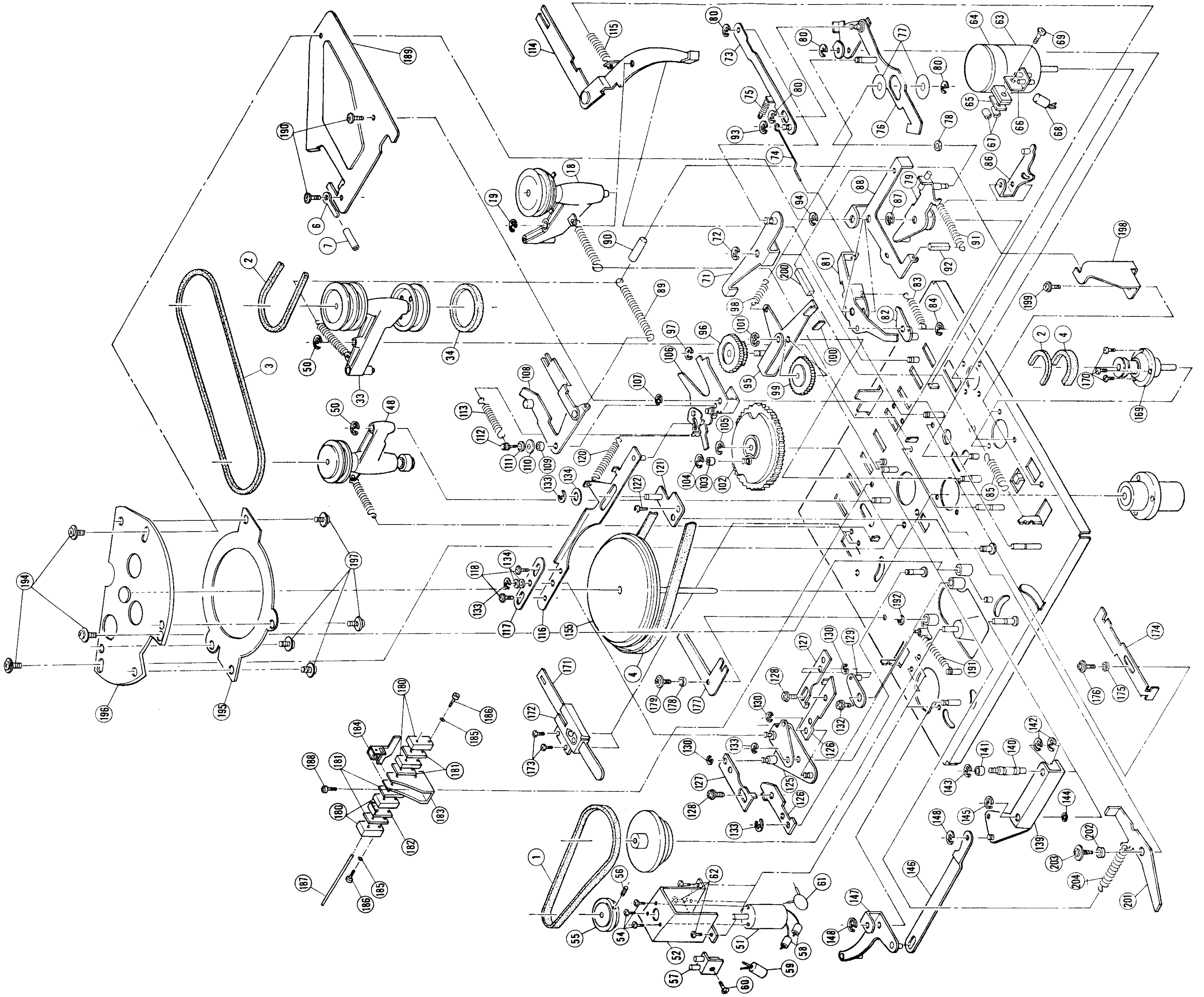
Symbol No.	Part No.	Part Name	Remarks
106	PU44212	Spacer	
107	PU45459	Switch Bracket	
108	WLS2300N	Lock Washer	
109	SPBP2310N	Screw	
110	LPSP3006ZS	"	
111	PU44848A	REC Safety Lever Ass'y	
112	PU35005-34	Spring	
113	LPSP3006ZS	Screw	
114	PU47939	Counter Pulley	
115	REE2500	"E" Ring	
116	PU47928A	Counter Bracket Ass'y	
117	PU47945	Tape Counter	
118	LPSP3006ZS	Screw	
119	PU47946	Slide Switch	SEARCH Switch
120	WLS2000N	Lock Washer	
121	SPSP2004Z	Screw	
122	PU47927	Switch Bracket	
123	PU43172-1-27	Nylon Grommet	
124	LPSP3006ZS	Screw	
125	PU47974A	Pinch Slide Plate Ass'y	
126	REE3000	"E" Ring	
127	Q03093-502	Washer	
128	REE3000	"E" Ring	
129	LPSP3006ZS	Screw	
130	PU47972	Pause Brake Cancel Lever	
131	T30302-004	Collar	
132	DPSP3006ZS	Screw	
133	GA40154-2	Moltpren	
134	PU47977A	Adjust Plate Ass'y	
135	DPSP3005ZS	Screw	
136	PU35005-105	Spring	
137	REE5000	"E" Ring	
138	PU47976A	Pinch Roller Arm Ass'y	
139	PU43769-30	Collar	
140	LPSP2604Z	Screw	
141	PU47979	Memory Plate	
142	Q03093-502	Washer	
143	REE3000	"E" Ring	
144	PU35005-109	Spring	
145	PU44840A	Eject Lever Ass'y	
146	T30302-008	Collar	
147	DPSP3006ZS	Screw	
148	PU47933	Capstan Motor Pulley	
149	YWS3003PS	Set Screw	
150	LPSP3005ZS	Screw	
151	Q03093-405	Washer	
152	PU47205A	Capstan Bearing Ass'y	
153	PU44905-3	Relay Pulley (A)	
154	YWS3004PS	Set Screw	
155	LPSP3006ZS	Screw	
156	PU47209	Shield Cap	
157	QLP3104-111	Cassette Lamp	
158	PU47728	Cassette Lamp Holder	
159	–	–	
160	QSM1S01-028	Microswitch	UL-1 and UL-2

Symbol No.	Part No.	Part Name	Remarks
161	PU44212	Spacer	
162	WLS2300N	Lock Washer	
163	SPBP2318N	Screw	
164	SPBP2316N	"	
165	PU47183A	Switch Bracket Ass'y	
166	LPSP3006ZS	Screw	
167	PU47837A	Audio/Control Head Base Ass'y	
168	DPSP3008ZS	Screw	
169	PU30080-49	Spring	
170	PU47934	Take-up Guide Pole	
171	NTB3000NS	Nut	
172	REE5000	"E" Ring	
173	PU30080-49	Spring	
174	PU46435-2T	Audio/Control Head Sub Ass'y	
175	SPSP3010ZS	Screw	
176	PU47812A	Take-up Impedance Roller Ass'y	
177	T30300-004	Spring	
178	PU47821	Lever	
179	PU47823	Shaft	
180	PU30080-61	Spring	
181	PU47820	Lever	
182	REE3000	"E" Ring	
183	PU47822	Stopper	
184	—	—	
185	—	—	
186	WNB2600N	Washer	
187	SPSP2603N	Screw	
188	T30300-114	Spring	
189	Q03093-508	Washer	
190	PU47889	Cancel Lever	
191	PU43769-31	Collar	
192	DPSP3006ZS	Screw	
193	PU47886-1-1	Lock Lever	
194	T30300-119	Spring	
195	REE4000	"E" Ring	
196	PU47824A	Head Arm Ass'y	
197	PU47863	Full Erase Head	
198	LPSP2004Z	Screw	
199	PU30080-49	Spring	
200	PU47934	Supply Guide Pole	
201	NTB3000NS	Nut	
202	PU47830	Lock Arm (Supply)	
203	PU47829	Lock Arm	
204	PU47823	Shaft	
205	PU30080-61	Spring	
206	REE3000	"E" Ring	
207	PU47831	Stopper	
208	WNB2600N	Washer	
209	SPSP2603Z	Screw	
210	PU47832	Flat Spring	
211	LPSP3004ZS	Screw	
212	WNS3000N	Washer	
213	PU35005-86	Spring	
214	REE5000	"E" Ring	
215	—	—	

Symbol No.	Part No.	Part Name	Remarks
216	Q03093-103	Washer	
217	–	–	
218	–	–	
219	Q03093-508	Washer	
220	2SC1983R	Transistor	for Mechanism Control
221	PU45375	Spacer	for (220) Transistor
222	PU41624-6	Insulator	
223	LPSP3010ZS	Screw	
224	–	–	
225	–	–	
226	–	–	
227	–	–	
228	–	–	
229	–	Drum Ass'y	REF: M3
230	PU47833	Arm Stopper	
231	LPSP3006ZS	Screw	
232	PU46396	Start Sensor Board Bracket	
233	LPSP3006ZS	Screw	for Start Sensor Board
234	LPSP3006ZS	"	
235	PU44895	End Sensor Board Bracket	
236	DPSP3006ZS	Screw	for End Sensor Board
237	LPSP3006ZS	"	
238	DPSP3010ZS	"	for Drum Ass'y
239	PU44906-1-5	Arm Stopper	
240	LPSP3006ZS	Screw	
241	PU31934	Cassette Door Guide	
242	–	Tape Guard Circuit Board Ass'y	REF: 09
243	DPSP3005ZS	Screw	
244	PU20854	Side Bracket	Left Side
245	PU47923	Side Holder	
246	LPSP3006ZS	Screw	
247	55234	Wire Clamp	
248	QXT3320-025	Vinyl Tube	
249	PU47876	Circuit Board Holder	
250	PU48017	Wire Clamp	
251	DPSP3006ZS	Screw	
252	PU48281A	Pause Brake Ass'y	Incl: (253) Brake Shoe
253	PU41057	Brake Shoe	
254	PU35005-16	Spring	
255	REE3000	"E" Ring	
256	REE2500	"E" Ring	
257	DPSP3005ZS	Screw	for Tape Guard Circuit Board
258	–	–	
259	–	–	
260	–	–	
261	–	–	
262	–	–	
263	–	–	
264	PU47925-1-2	Circuit Board Bracket	
265	LPSP3006ZS	Screw	
266	–	–	
267	–	–	
268	–	–	
269	QSM1S01-014	Microswitch	AL-1, AL-2
270	PU47985	Leaf Spring	

Symbol No.	Part No.	Part Name	Remarks
271	PU46086	Lock Lever	
272	T30302-004	Collar	
273	–	–	
274	DPSP3005ZS	Screw	
275	PU31492-1-3	Wire Holder	
276	DPSP3006ZS	Screw	
277	–	Function Ass'y	REF: M5
278	–	Operation Circuit Board Ass'y	REF: 07
279	–	–	
280	–	Audio/Control Head Circuit Board	REF: 30
281	–	Start Sensor Circuit Board	REF: 19
282	–	End Sensor Circuit Board	REF: 20
283	–	Power Transistor Circuit Board	REF: 41 for SERVO
284	–	Power Transistor Circuit Board	REF: 26 for SERVO
285	–	Full Erase Head Circuit Board	REF: 31
286	–	–	
287	–	–	
288	PU48283A	Adjust Plate Ass'y	
289	DPSP3005ZS	Screw	
290	55234	Wire Clamp	
291	QXT3320-025	Vinyl Tube	
292	PU44918-4	F.F. Rubber Tire	
293	PU47188	Switch Bracket	for AL Switch
294	PU47376	Leaf Spring	for Cassette Switch
295	PU46431	Pause Solenoid	
296	PU47187-1-2	Bracket	
297	PU48287	Spring Holder	
298	LPSP3006ZS	Screw	
299	V03C	Diode	
300	PU48285A	Spring Holder Ass'y	
301	PU30080-57	Spring	
302	PRE3010	Spring Pin	
303	PU47327	Spacer	
304	REE2500	"E" Ring	
305	DPSP3005ZS	Screw	

7.3 MAIN DECK-2 M2



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Symbol No.	Part No.	Part Name	Remarks
1	PU44912-5	Drum Belt	
2	PU44911	REW Idler Belt	
3	PU44912-3	Unloading Idler Belt	
4	PU44912-2	Capstan Belt	
5	–	–	
6	55234	Wire Clamp	
7	QXT3320-025	Vinyl Tube	
8	–	–	
9	–	–	
10	–	–	
11	–	–	
12	–	–	
13	–	–	
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15	–	–	
16	–	–	
17	–	–	
18	PU47752	Take-up Idler Ass'y	
19	REE3000	"E" Ring	
20	–	–	
21	–	–	
22	–	–	
23	–	–	
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30	–	–	
31	–	–	
32	–	–	
33	PU47753	REW. Idler Ass'y	
34	PU44918-2	REW. Rubber Tire	
35	–	–	
36	–	–	
37	–	–	
38	–	–	
39	–	–	
40	–	–	
41	–	–	
42	–	–	
43	–	–	
44	–	–	
45	–	–	
46	–	–	
47	–	–	
48	PU46381	Unloading Idler Ass'y	
49	–	–	
50	REE3000	"E" Ring	
51	PU46414M	Drum Motor	
52	PU31335	Drum Motor Bracket	
53	–	–	
54	LPSP2004Z	Screw	
55	PUS46023A	Drum Motor Pulley Ass'y	Incl: (56) Setscrew

Symbol No.	Part No.	Part Name	Remarks
56	YWS3003PS	Setscrew	
57	V03082-2	Feed-Through Capacitor Ass'y	
58	PU45811	Ferrite Beads	
59	QEW41HA-105	Electrolytic Capacitor	1 μF, 50 V
60	LPSP3006ZS	Screw	
61	QCF11HP-223	Ceramic Capacitor	0.022 μF, 50 V
62	LPSP3004ZS	Screw	
63	PU47988-2M	Capstan Motor	
64	PU45980	Capstan Motor Band	
65	PU43730	Tapping Plate	
66	V03082-2	Feed Through Capacitor Ass'y	
67	PU45811	Ferrite Beads	
68	QEW41HA-105	Electrolytic Capacitor	1 μF, 50 V
69	LPSP3010ZS	Screw	
70	–	–	
71	PU45313B	PLAY Lever (1) Ass'y	
72	REE3000	"E" Ring	
73	PU45319A	PLAY Lever (2) Ass'y	
74	PU45321	Rod	
75	PU35005-6	Spring	
76	PU45315C	PLAY Lever (3) Ass'y	
77	Q03093-620	Washer	
78	Q03093-102	"	
79	PU45299A	Change Lever Ass'y	
80	REE3000	"E" Ring	
81	PU45306A	Change Arm Lock Lever Ass'y	
82	PU45308A	Drive Arm Lock Lever Ass'y	
83	PU35005-53	Spring	
84	REE3000	"E" Ring	
85	PU35005-48	Spring	
86	PU45301A	Kick Lever Ass'y	
87	REE5000	"E" Ring	
88	PU45303B-4	Timing Arm Ass'y	
89	PU35005-93	Spring	
90	QXT665H-025	Vinyl Tube	
91	T30300-003	Spring	
92	GA40154-2	Moltplen	
93	REE3000	"E" Ring	
94	REE5000	"	
95	PU47213A	Gear Arm Ass'y	
96	PU47215	Stepped Gear	
97	REE3000	"E" Ring	
98	T30300-029	Spring	
99	PU45298-2	Change Gear	
100	PU45673	Cushion	
101	REE4000	"E" Ring	
102	PU45311A	Timing Gear Ass'y	
103	PU43769-22	Collar	
104	REE3000N	"E" Ring	
105	REE4000	"	
106	PU45242A	Drive Arm Ass'y	
107	REE5000	"E" Ring	
108	PU45247A	Change Arm Ass'y	Incl: Collar (PU43769-18) and "E" Ring (REE3000N)
109	T30302-025	Collar	
110	Q03091-103	Washer	

Symbol No.	Part No.	Part Name	Remarks
111	WLS3000	Lock Washer	
112	PU44224	Spring Hook	
113	PU35005-74	Spring	
114	PU46228C	Timing Arm Ass'y	
115	PU35005-41	Spring	
116	PU45238A	Slide Plate Ass'y	
117	PU45240	Adjusting Plate	(119) Slide Plate Ass'y
118	DPSP3006ZS	Screw	
119	PU45841A	Slide Plate Ass'y	
120	PU35005-75	Spring	
121	PU46853A	Spring Plate Ass'y	
122	DPSP3006ZS	Screw	
123	–	–	
124	–	–	
125	PU44987C	Rotary Lever Ass'y	
126	PU45821	Adjusting Plate (1)	
127	PU45820	" (2)	
128	DPSP3005ZS	Screw	(131) Stepped Lever Ass'y
129	PU44985A	Supply Lever Ass'y	
130	REE3000	"E" Ring	
131	PU45836C	Stepped Lever Ass'y	
132	DPSP3006ZS	Screw	
133	REE3000	"E" Ring	
134	Q03093-502	Washer	
135	–	–	
136	–	–	
137	–	–	
138	–	–	
139	PU45250A	Take-up Lock Lever Ass'y	
140	PU45252	Stud	
141	PU43769-23	Collar	
142	REE4000N	"E" Ring	
143	REE3000N	"	
144	Q03093-507	Washer	
145	REE5000	"E" Ring	
146	PU45255	Connecting Lever	
147	PU45253C	Supply Lock Lever Ass'y	
148	REE3000	"E" Ring	
149	–	–	
150	–	–	
151	–	–	
152	–	–	
153	–	–	
154	–	–	
155	PU32257B-1	Capstan Flywheel Ass'y	
156	–	–	
157	–	–	
158	–	–	
159	–	–	
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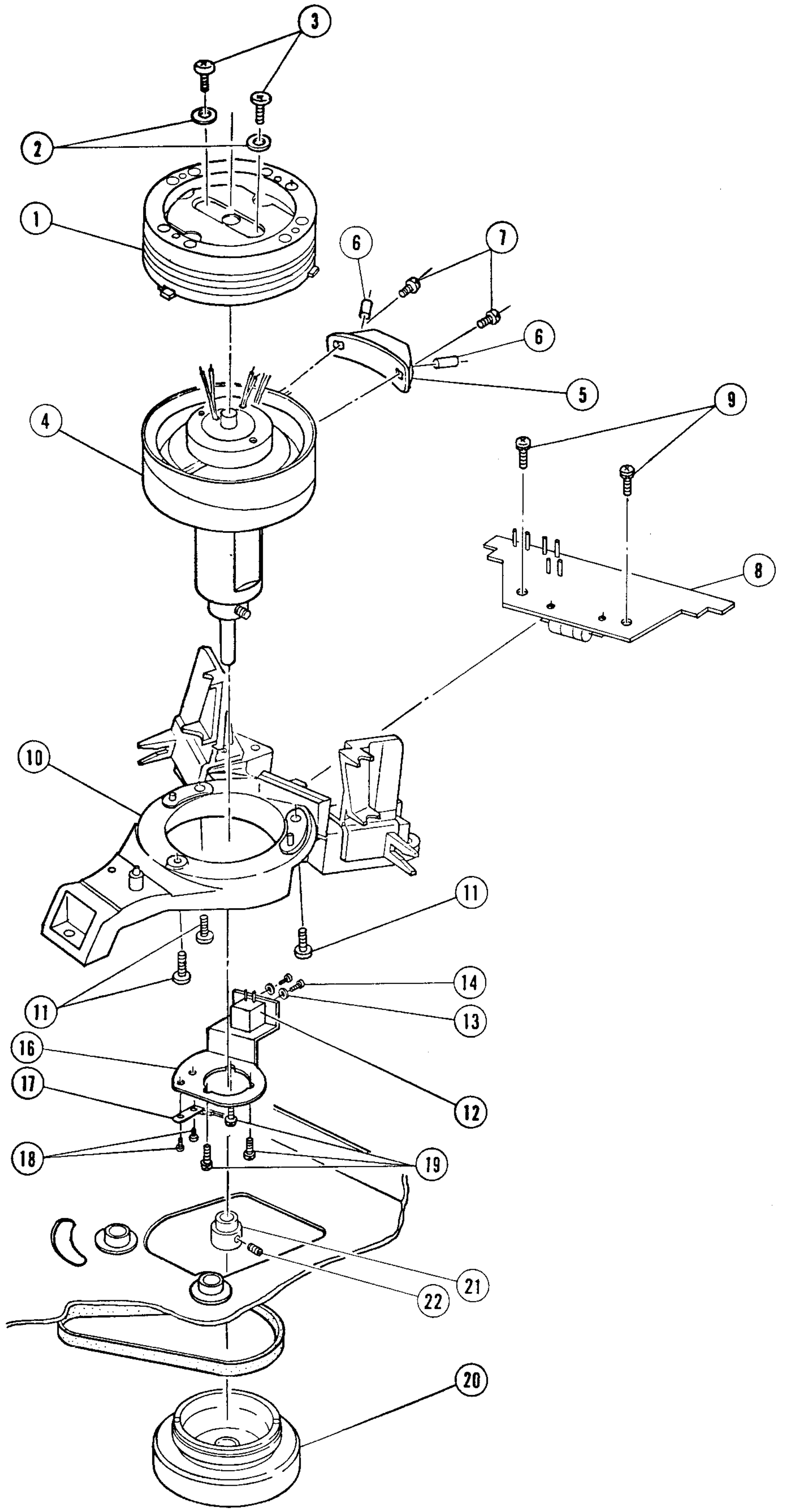
162	–	–	
163	–	–	
164	–	–	
165	–	–	

Symbol No.	Part No.	Part Name	Remarks
166	–	–	
167	–	–	
168	–	–	
169	PU44901A	Relay Pulley Ass'y	
170	LPSP3006ZS	Screw	
171	PU44871A	Pause Lever Ass'y	
172	PU44874A	Lock Bracket Ass'y	
173	LPSP3006ZS	Screw	
174	PU47919	F.F. Lever	
175	T30302-025	Collar	
176	DPSP3006ZS	Screw	
177	PU47835	Cancel Lever	
178	T30302-025	Collar	
179	DPSP3006ZS	Screw	
180	QSM1S11-201	Microswitch	for Full Recording and After Recording Switch
181	PU44212	Spacer	
182	PU47840	Leaf Spring	
183	PU48013	Switch Bracket	
184	PU48011	Lever	
185	WLS2300N	Lock Washer	
186	SPBP2318N	Screw	
187	PU48012	Rod	
188	LPSP3006ZS	Screw	
189	PU45325-2	Plate	
190	LPSP3006ZS	Screw	
191	T30300-029	Spring	
192	REE4000	"E" Ring	
193	–	–	
194	DPSP3006ZS	Screw	
195	PU48068	F.G. Circuit Board	
196	PU48070A	Circuit Board Holder Ass'y	
197	DPSP3005ZS	Screw	
198	PU48483	Spring Hook	
199	LPSP3006ZS	Screw	
200	GA40154-2	Moltplen	
201	PU47724	Stopper	
202	T30302-006	Collar	
203	DPSP3006ZS	Screw	
204	PU35005-22	Spring	

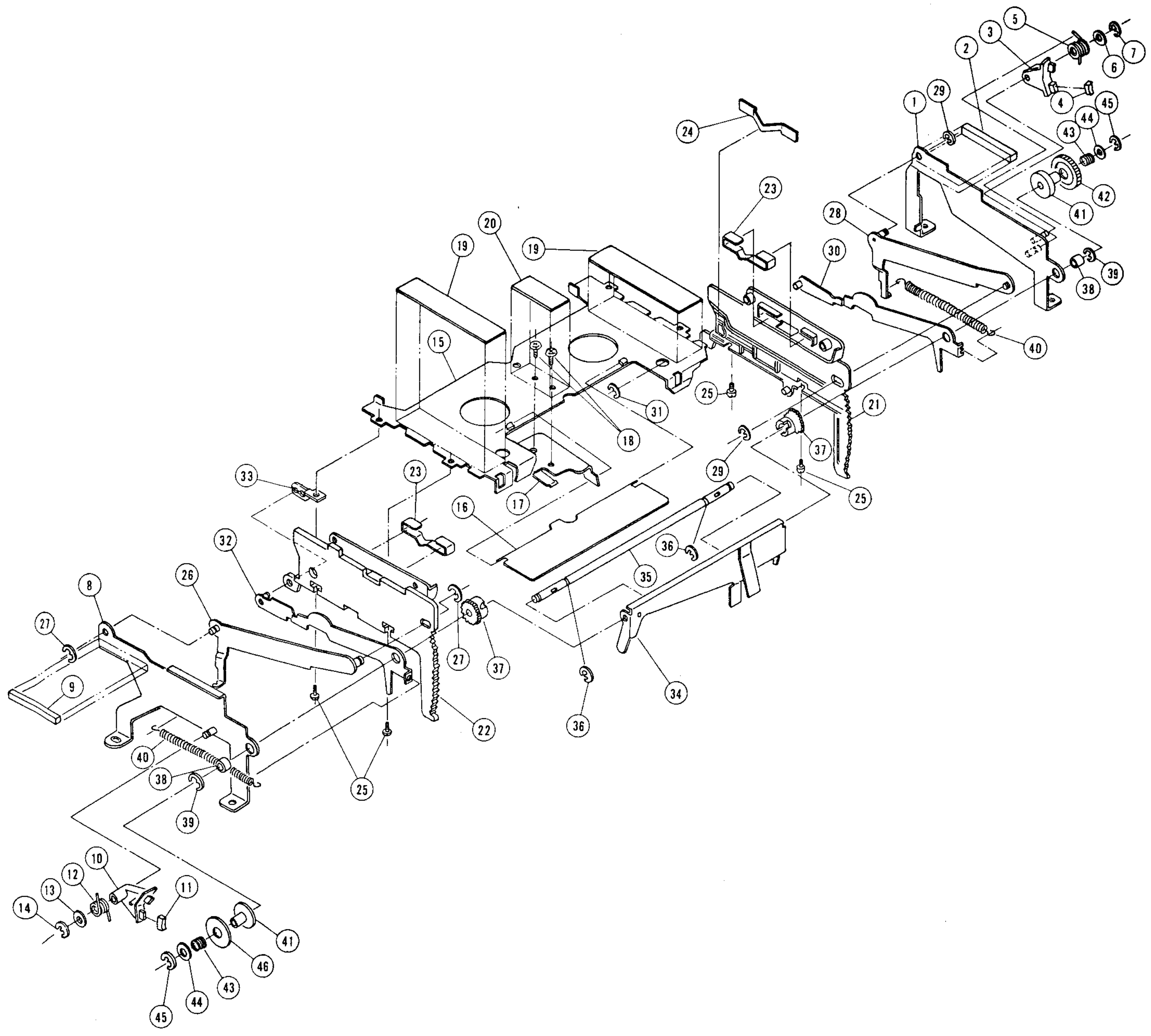
7.4 DRUM ASSEMBLY $\boxed{M}\boxed{3}$



Symbol No.	Part No.	Part Name	Remarks
1	PU20850A	Upper Drum Ass'y	
2	WNB3000N	Washer	
3	SPBP3010NS	Screw	
4	PU31328F	Lower Drum Sub Ass'y	Incl: ㉑ Collar, ㉒ Setscrew
5	⚠PU44973B	Heater Ass'y	
6	QXT3140-025	Vinyl Tube	
7	SDBP3006NS	Screw	
8	⚠ –	Heat & R.T. Select Board Ass'y	REF: $\boxed{1}\boxed{2}$
9	LPSP3006ZS	Screw	
10	–	Drum Base Ass'y	Not supplied as Service Parts.
11	SPBP3008NS	Screw	
12	PU47199	Pick-up Head	
13	WSB2000N	Washer	
14	SPBP2003N	Screw	
15	–	–	
16	PU44971	Pick-up Head Bracket	
17	PU44972A	Brush Ass'y	
18	SPBP2003N	Screw	
19	LPSP2606Z	Screw	
20	PU44965A	Drum Pulley Ass'y	Incl: Setscrew (YFS4006)
21	PU44969	Collar	
22	YFS3003	Setscrew	for ㉑ Collar

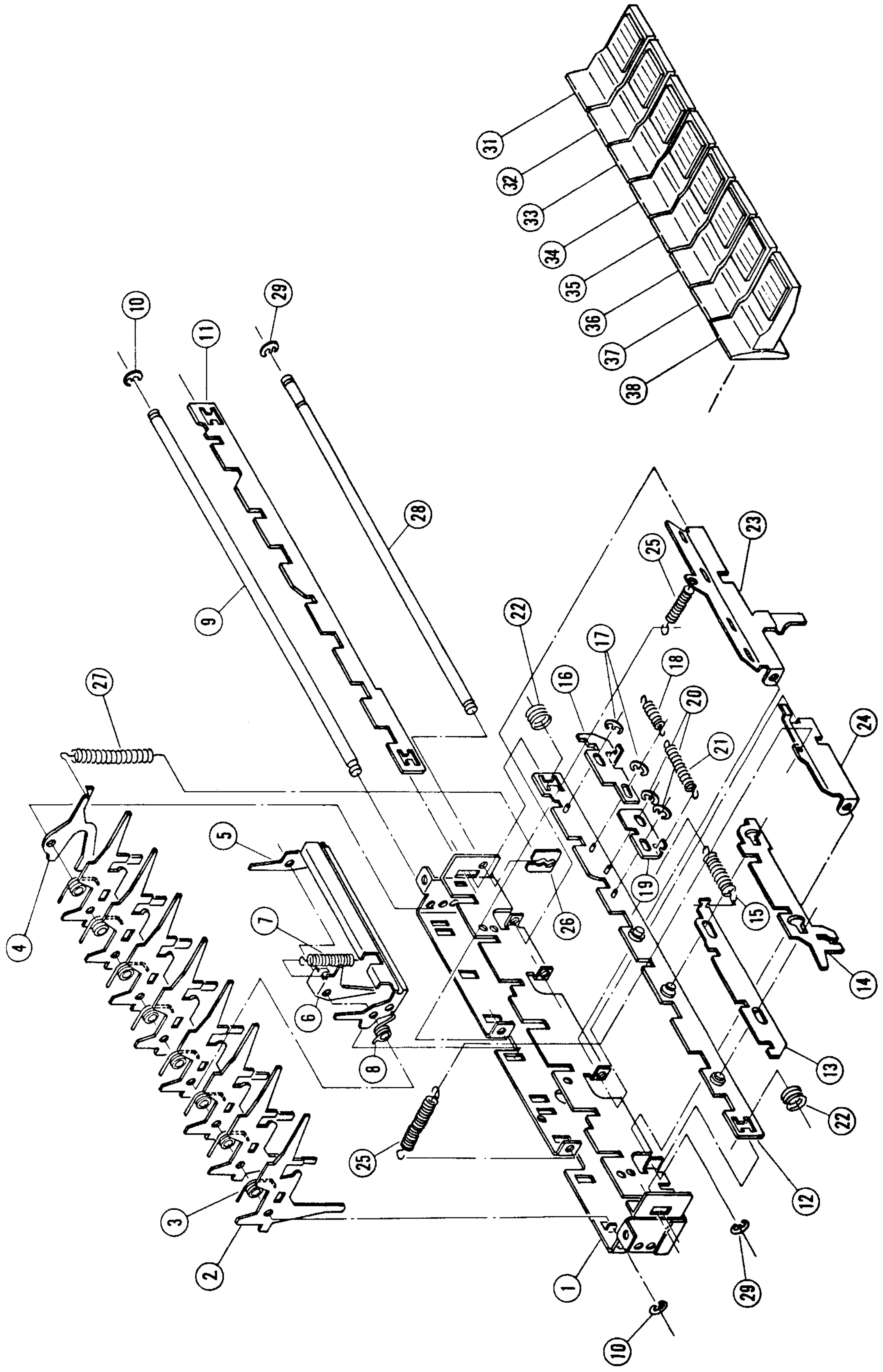
Note: *Parts identified by the ⚠ symbol are ctitical for safety.*
Replace only with specified part numbers.
For maximum reliability and performance, all other replacement parts should be identical to those specified.

7.5 CASSETTE HOUSING ASSEMBLY M4



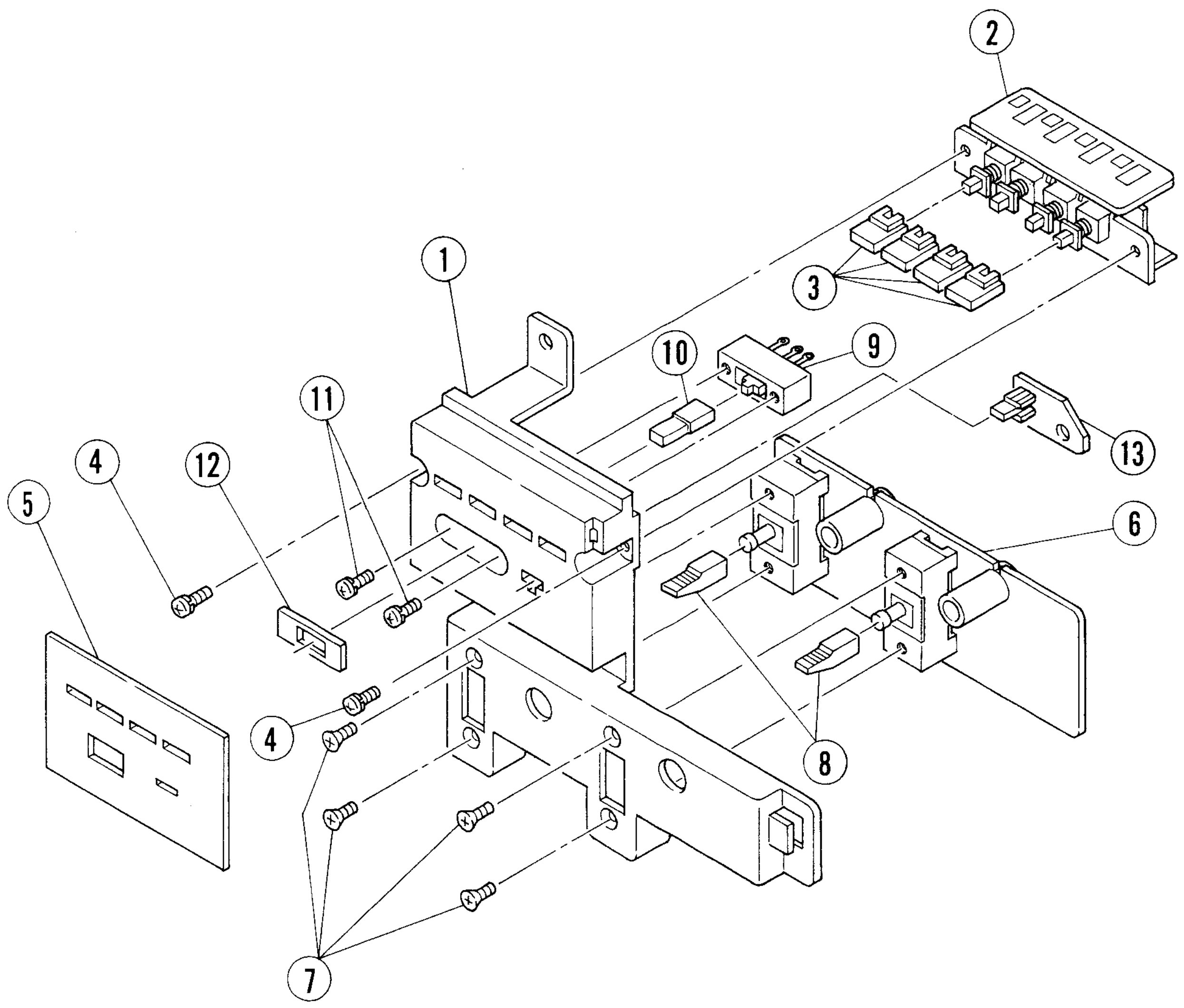
Symbol No.	Part No.	Part Name	Remarks
1	PU47760A	Right Side Bracket Ass'y	
2	PU45509-2	Shade	
3	PU47762	Brake Arm	
4	PU47763	Rubber Tire	
5	PU47764	Tension Spring	
6	Q03091-138	Washer	
7	REE2000	"E" Ring	
8	PU47761A	Left Side Bracket Ass'y	
9	PU45509-2	Shade	
10	PU47762	Brake Arm	
11	PU47763	Rubber Tire	
12	PU47764-2	Tension Spring	
13	Q03091-138	Washer	
14	REE2000	"E" Ring	
15	PU31620	Plate	
16	PU32082	Cover	㊾ Cassette Housing Ass'y Note: Change them by Cassette Housing Ass'y except ㉓, ㉔
17	PU47765A	Lower Plate Ass'y	
18	SPSP2603Z	Screw	
19	PU40867-2	Felt	
20	PU40867-3	"	
21	PU20543-2	Right Sdie Housing	
22	PU20544-2	Left Side Housing	
23	PU45549	Spring	
24	PU45550	"	
25	LPSP2006Z	Screw	
26	PU47454A	U. Arm Ass'y	Left Side
27	REE4000	"E" Ring	
28	PU47454B	U. Arm Ass'y	Right Side
29	REE4000	"E" Ring	
30	PU31336A	Lower Arm Ass'y	Right Side
31	REE4000	"E" Ring	
32	PU31336B	Lower Arm Ass'y	Left Side
33	PU46497	Spring Plate	
34	PU32200A	Lock Lever Ass'y	
35	PU32201A	Shaft Ass'y	
36	REE4000	"E" Ring	
37	PU45364	Gear	
38	PU43769-26	Collar	
39	REE4000	"E" Ring	
40	T30300-93	Spring	
41	PU47766	Clutch Drum	
42	PU47767	Brake Drum	Right Side
43	PU30080-59	Spring	
44	WNS5000N	Washer	
45	REE3000	"E" Ring	
46	PU47767-2	Brake Drum	Left Side
47	–	–	
48	–	–	
49	PUS25762C	Cassette Housing Ass'y	
–	DPSP3006ZS	Screw	for Setting Cassette Housing

7.6 FUNCTION ASSEMBLY M5



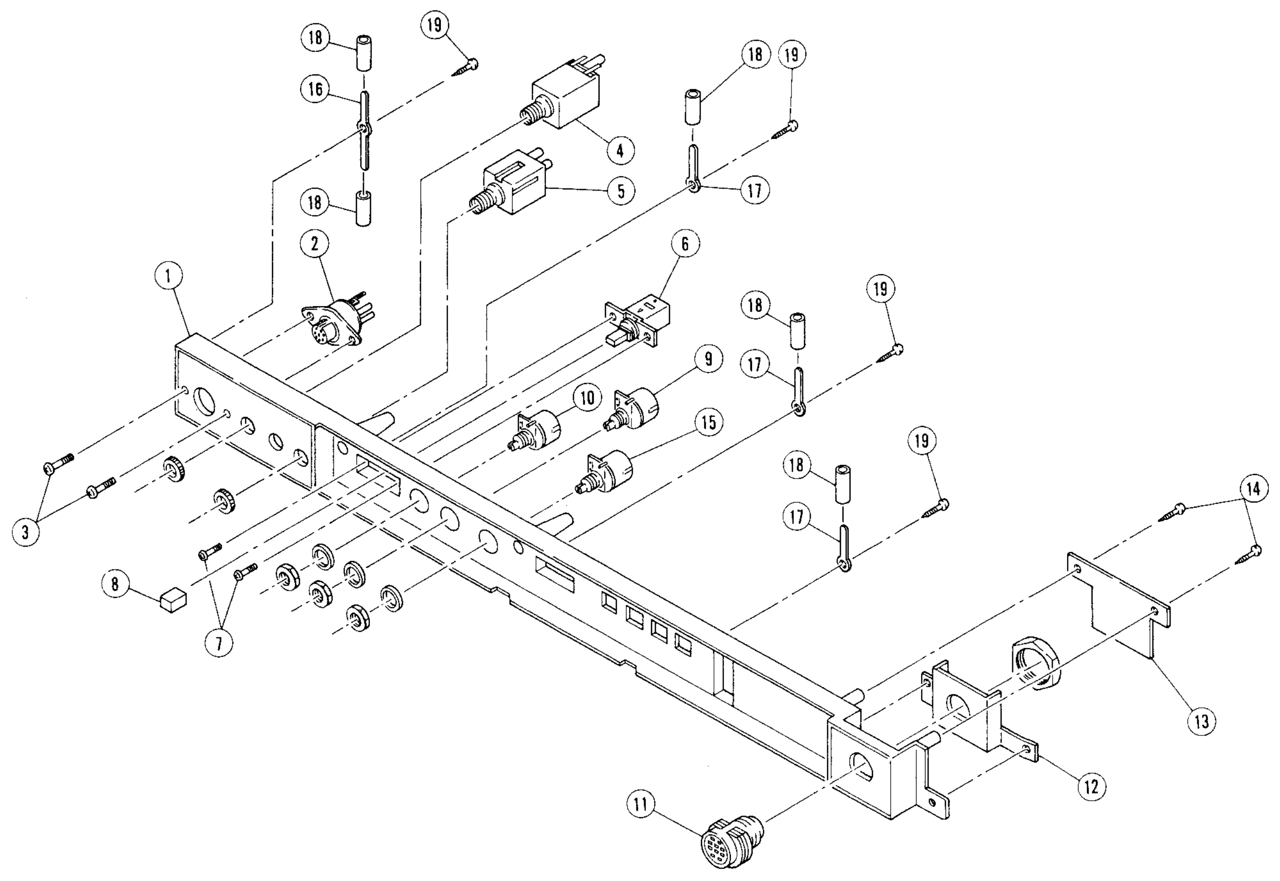
Symbol No.	Part No.	Part Name	Remarks
1	PU20540	Button Case	
2	PU47175	Lever	
3	PU45800	Return Spring	
4	PU44800	Lock Lever	
5	PU32187	Swing Plate (L)	
6	PU47731	Swing Plate (S)	
7	PU35005-103	Spring	
8	PU44231	″	
9	PU44801	Shaft	
10	REE3000	"E" Ring	
11	PU31766	Function Plate (A)	
12	PU32197A	Function Plate (B) Ass'y	
13	PU47412	Function Plate (C)	
14	PU47413	Function Plate (E)	㊴ Function Ass'y
15	PU35005-99	Spring	
16	PU47733	Function Plate (F)	
17	REE2500	"E" Ring	Note: Change them by Function Ass'y
18	PU35005-34	Spring	except ㉛ – ㊳
19	PU47734	Function Plate (G)	
20	REE2500	"E" Ring	
21	PU35005-72	Spring	
22	PU30080-58	″	
23	PU32186	Lock Plate (L)	
24	PU47735	″ (S)	
25	PU35005-17	Spring	
26	PU47732	Spring Hook	
27	PU35005-99	Spring	
28	PU44806	Shaft	
29	REE2500	"E" Ring	
30	–	–	
31	PU47843D	EJECT Button Ass'y	
32	PU47843E	F.F. Button Ass'y	
33	PU47843E	PLAY Button Ass'y	
34	PU47843D	STOP Button Ass'y	
35	PU47843E	REW Button Ass'y	
36	PU47843B	REC Button Ass'y	
37	PU47843C	AUDIO DUB Button Ass'y	
38	PU47843E	PAUSE Button Ass'y	
39	PUS36036B	Function Ass'y	

7.7 SWITCH BOX ASSEMBLY M6



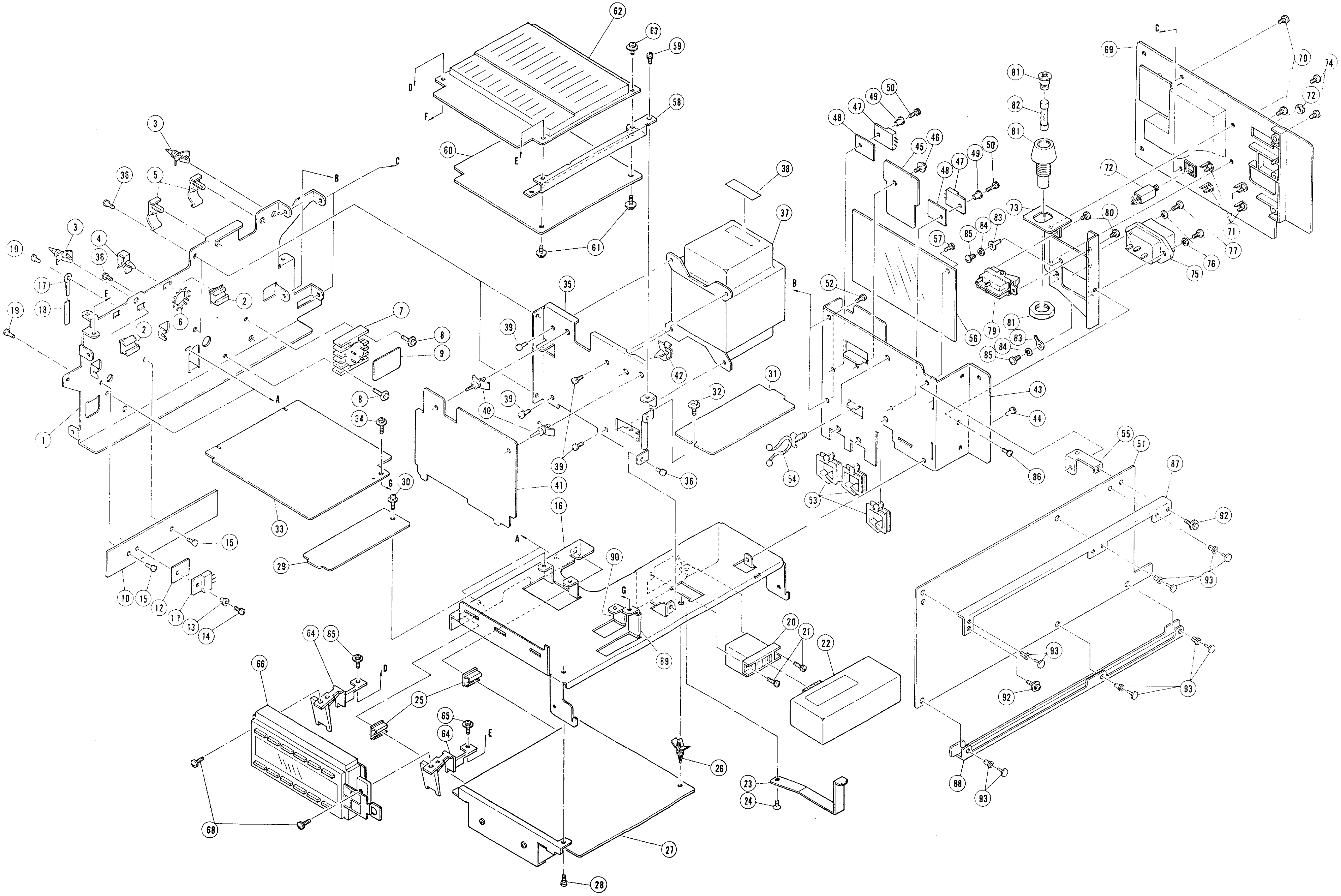
Symbol No.	Part No.	Part Name	Remarks
1	PU20844-1-5	Switch Cover	
2	–	Slow/Still Switch circuit Board Ass'y	REF: 14
3	PU47909-2	Push Knob	
4	LPSP3006ZS	Screw	
5	PU47847-5	Plate	
6	–	Function Circuit Board Ass'y	REF: 10
7	SSSP2604Z	Screw	
8	PU47807	Knob	
9	PU48029	Lever Switch	SP/EP Select Switch
10	PU48027	Knob	
11	LPSP2606Z	Screw	
12	PU48028	Plate	
13	–	LED Circuit Board	REF: 42

7.8 CONTROL BOX ASSEMBLY M7



Symbol No.	Part No.	Part Name	Remarks
1	PU20833-1-3	Control Box	
2	PU47757-2	DIN Jack (8 Pin)	for REMOTE
3	SDBP2606M	Screw	
4	QMS6304-012	Headphone Jack	
5	QMS6303-003	Microphone Jack	
6	PU47855	Push Switch	REC. Select
7	LPSP2006Z	Screw	
8	PU47860	Knob	for ⑥ Push Switch
9	QVF1A6B-1F5V	VR	Slow Tracking
10	QVF1A6B-055V	〃	Slow Speed
11	PU47775B	Camera Connector Ass'y (10 Pin)	
12	PU47858	Connector Bracket	
13	–	Connector Circuit Board	REF: 28
14	SDSA3006Z	Screw	
15	PU47920	VR	Tracking
16	PU45119	Wire Clamp	
17	55234	〃	
18	QXT3320-025	Vinyl Tube	
19	SDSA3006Z	Screw	

7.9 TUNER UNIT ASSEMBLY M8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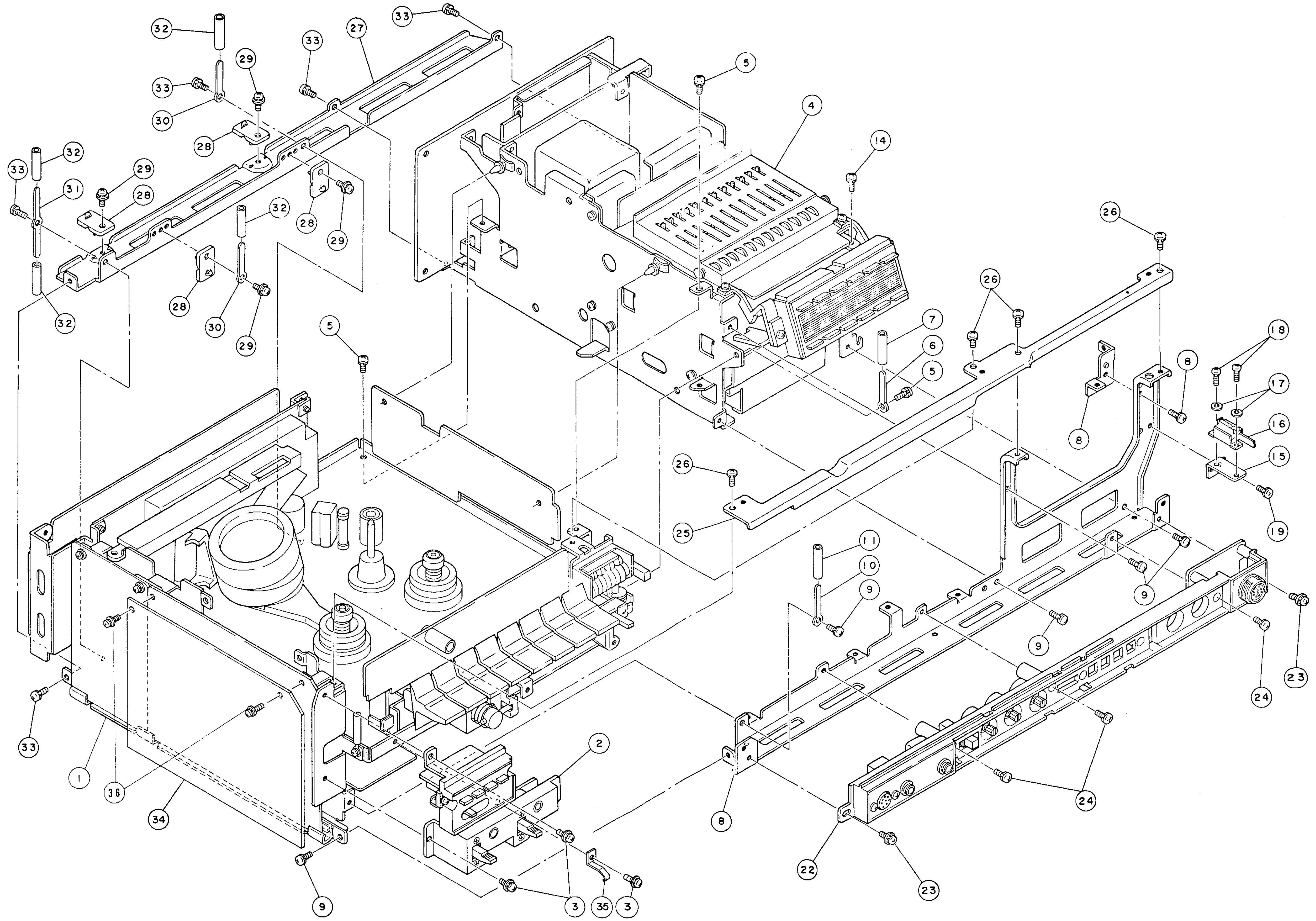
Symbol No.	Part No.	Part Name	Remarks
1	PU20851	Side Bracket (Right)	
2	PU47876	Circuit Board Support	
3	PU43146	LCB Support	
4	PU48016	Mini Clamp	
5	PU48019	Wire Clip	
6	PU43172-1-41	Nylon Grommet	
7	M4B51-11	Diode Stack	DS 1
8	GPST3016ZS	Tap. Screw	
9	–	Diode Stack Circuit Board	REF: $\boxed{3}\boxed{9}$
10	PU48208	Heat Sink	
11	2SC1983R	Transistor	for Camera Power
12	PU45375	Spacer	
13	PU41624-6	Insulator	
14	LPSP3008ZS	Screw	for ⑪ Transistor
15	SPST3006ZS	Tap. Screw	for ⑩ Heat Sink
16	PU20852A	Tuner Base Ass’y	
17	55234	Wire Clamp	
18	QXT3320-025	Vinyl Tube	
19	SPST3006ZS	Tap. Screw	for Tuner Base Ass’y
20	PUS36047A	RF. Connector Ass’y	
21	SPST3010ZS	Tap. Screw	for RF. Connector Ass’y
22	PU30913P	RF. Converter	U.S. 3–4 Channel
23	PU47880	RF. Converter Holder	
24	SSST3010ZS	Tap. Screw	for ㉓ RF. Converter Holder
25	PU47876	Circuit Board Support	
26	PU43146	LCB Support	
27	–	Tuner/IF Circuit Board Ass’y	REF: $\boxed{1}\boxed{8}$
28	SPST3006ZS	Tap. Screw	
29	–	Back-up Circuit Board Ass’y	REF: $\boxed{2}\boxed{4}$
30	GPST3008ZS	Screw	for Back-up Circuit Board Ass’y
31	–	Camera Power Circuit Board Ass’y	REF: $\boxed{4}\boxed{0}$
32	GPST3008ZS	Tap. Screw	for Camera Power Circuit Board
33	–	Programmable Timer Circuit Board Ass’y	REF: $\boxed{2}\boxed{1}$
34	GPST3008ZS	Tap. Screw	
35	PU32248	Transformer Bracket	
36	SPST3006ZS	Tap. Screw	
37	⚠PU47717	Power Transformer	“Only U.S.A.”, 120 V, 60 Hz
38	PU42091	No. Plate	
39	LPSP4008ZS	Screw	for Power Transformer
40	PU43146	LCB Support	for Joint Board
41	–	Joint Circuit Board Ass’y	REF: $\boxed{1}\boxed{5}$
42	PU48016	Mini Clamp	
43	PU20880	Heat Sink	
44	⚠SXST3008ZS	Screw	for ㊸ Heat Sink
45	–	Power Transistor Circuit Board	REF: $\boxed{2}\boxed{7}$
46	DPSP3008ZS	Screw	for ㊺ Power Transistor Circuit Board
47	2SC2484P	Transistor	X1, X2
48	PU45375-4	Spacer	
49	PU41624-12	Insulator	
50	LPSP3008ZS	Screw	for Transistor X1, X2
51	–	Regulator Circuit Board Ass’y	REF: $\boxed{0}\boxed{1}$
52	SPST3006ZS	Tap. Screw	
53	PU46775	Edge Cover	
54	PU47879	Lead Clamper	
55	PU47882	Tap Bracket	

Symbol No.	Part No.	Part Name	Remarks
56	PU48196	Plate	
57	LPSP3006ZS	Screw	for (55) Tap Bracket, (56) Plate
58	PU32273	Presetter Bracket	
59	SPST3006ZS	Tap. Screw	
60	–	Channel Select Circuit Board Ass’y	REF: $\boxed{1}\boxed{7}$
61	GPST3006ZS	Tap. Screw	for (60) CH. Select Circuit Board Ass’y
62	–	Presetter Circuit Board Ass’y	REF: $\boxed{1}\boxed{6}$
63	GPST3006ZS	Tap. Screw	for (62) Presetter Circuit Board Ass’y
64	PU48038	Channel Switch Holder	
65	GPST3008ZS	Tap. Screw	
66	PU47651-2	Channel Select Switch	
67	–	–	
68	SDSA3012Z	Tapping Screw	
69	PU47872	Connector Panel Ass’y	Incl: (71) – (85) “Only U.S.A.”
70	SDST3008MS	Tap. Screw	for (69) Connector Panel Ass’y
71	A75442	RCA Jack	VIDEO IN, OUT and AUDIO IN, OUT
72	QMS3501-009	Remote Jack	REMOTE (Pause)
73	–	Bracket	
74	SDSA3008Z	Screw	
75	⚠QMC0336-001	AC Inlet	120 V AC
76	WLS3000N	Lock Washer	
77	SPSP3008ZS	Screw	
78	–	–	
79	⚠QSE2135-005	Seesaw Switch	POWER Switch
80	SDBP3005ZS	Screw	
81	⚠QMG0301-003	Fuse Holder	
82	⚠QMF51U1-1R6	Fuse	1.6 A
83	⚠A50221-2	Lug	
84	⚠WLS4000N	Lock Washer	
85	⚠SPSP4006ZS	Screw	
86	⚠SXST3008ZS	Screw	
87	PU32244	Circuit Board Stay	Upper
88	PU32245	″	Lower
89	QXT6950-025	Vinyl Tube	
90	″ -015	″	
91	–	–	
92	GPST3008ZS	Tap. Screw	for Circuit Board Stay
93	E48729-001	Plastic Rivet	

Note: *Parts identified by the ⚠ symbol are critical for safety.*
Replace only with specified part numbers.
For maximum reliability and performance, all other replacement parts should be identical to those specified.

7.10 CHASSIS ASSEMBLY M 9



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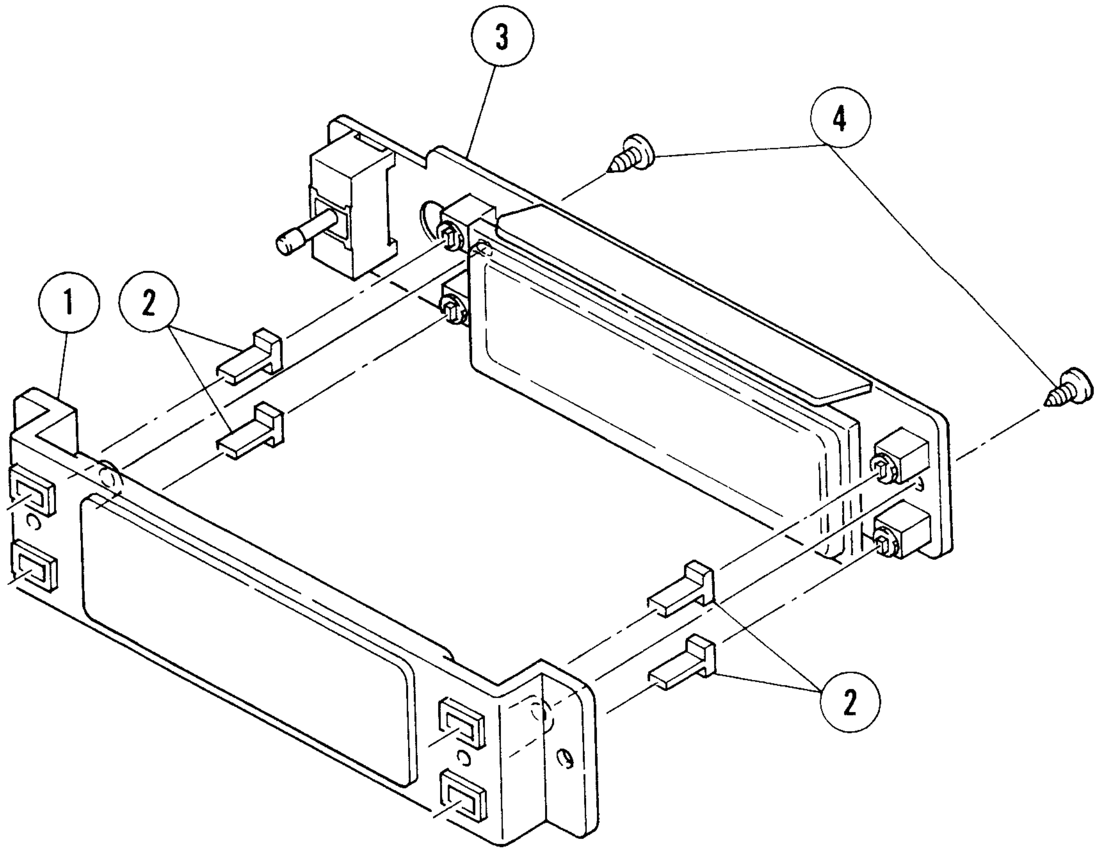
Symbol No.	Part No.	Part Name	Remarks
1	–	Main Deck Ass'y	REF: M1, M2, M3 and M5
2	–	Switch Box Ass'y	REF: M6
3	DPSP3008ZS	Screw	
4	–	Tuner Unit Ass'y	REF: M8
5	LPSP3006ZS	Screw	
6	55234	Wire Clamp	
7	QXT3320-025	Vinyl Tube	
8	PU10232A	Front Stay Ass'y	
9	LPSP3006ZS	Screw	
10	55234	Wire Clamp	
11	QXT3320-025	Vinyl Tube	
12	–	–	
13	–	–	
14	LPSP3006ZS	Screw	
15	PU48037	Switch Bracket	
16	PU44738	Push Switch	Channel Lock
17	WLS2000N	Lock Washer	
18	SPSP2004Z	Screw	
19	LPSP3006ZS	Screw	for ⑮ Switch Bracket
20	–	–	
21	–	–	
22	–	Control Box Ass'y	REF: M7
23	DPSP3008ZS	Screw	
24	LPSP3006ZS	"	
25	PU20859	Upper Stay	
26	LPSP3006ZS	Screw	for ㉕ Upper Stay
27	PU20856	Rear Stay	
28	PU31671	Hinge	
29	DPSP3006ZS	Screw	
30	55234	Wire Clamp	
31	PU45117	Wire Clamp	
32	QXT3320-025	Vinyl Tube	
33	LPSP3006ZS	Screw	
34	PU32357	Shield Plate	for Audio Circuit Board
35	⚠PU48095	Leaf Spring	for Grounding
36	DPSP3008ZS	Screw	

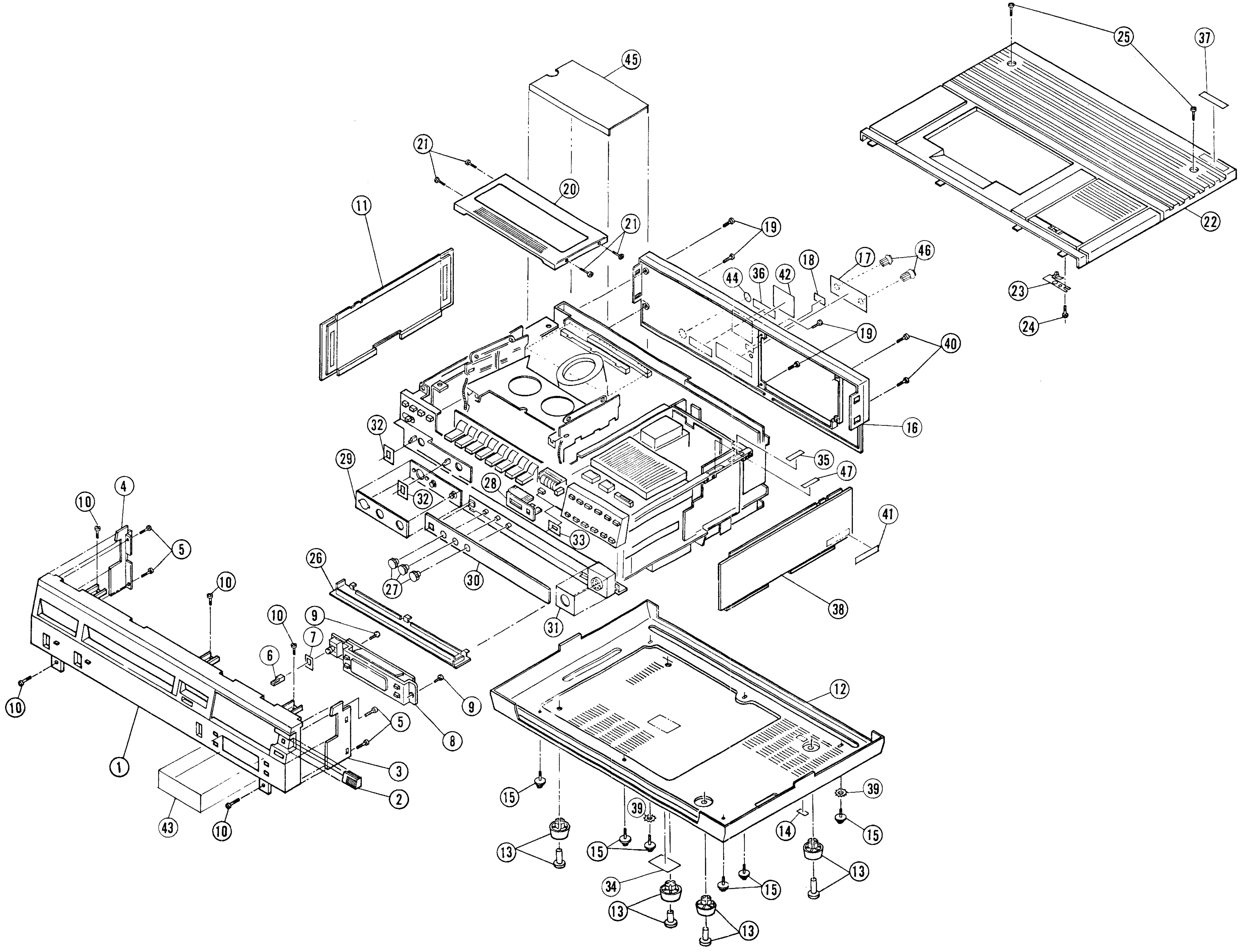
Note: *Parts identified by the ⚠ symbol are critical for safety.*
Replace only with specified part numbers.
For maximum reliability and performance, all other replacement parts should be identical to those specified.

7.11 DISPLAY ASSEMBLY MA



Symbol No.	Part No.	Part Name	Remarks
1	PU32221	Timer Window	
2	PU47846	Knob	
3	–	Display Circuit Board Ass'y	REF: 22
4	SDSA3008ZS	Tapping Screw	

7.12 CABINET ASSEMBLY M B



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SECTION 8
CHARTS AND DIAGRAMS

8.1 KEY TO ABBREVIATIONS

ACC : Automatic Color Control
A.E. : Audio Erase
AFC : Automatic Frequency Control
AFT : Automatic Fine Tuning
AGC : Automatic Gain Control
AL : After Loading
AMP : Amplifier
AR : After Recording

BAL : Balance
BBD : Bucket Brigade Device
BPF : Band-Pass Filter

CAP. : Capstan
C.D. : Count Down
CH. : Channel
CONN. : Connector
CONV. : Converter
CTL. : Control

DET. : Detector
DL : Delay Line
DOC : Drop Out Compensator

EF : Emitter Follower
EP : Extended Play
EQ : Equalizer
E.S. : End Sensor
E. SW : Electronic Switch

FE : Full Erase
FF IN : Flip-Flop Input
FG : Frequency Generator
FR : Full Recording

GEN : Generator

HPF : High-Pass Filter

INV : Inverter

LPF : Low-Pass Filter

MDA : Motor Drive Amplifier
MIC : Microphone
MM : Monostable Multivibrator
MOD. : Modulator

NF : Negative Feedback

OPE. : Operation
OSC : Oscillator

P.B. : Playback
P. TR. : Power Transistor

REG. : Regulator
R/P : Record/Playback
R/S : Record/Stop
R.T. : Rotary Transformer
RY : Relay

SF : Source Follower
SOL. : Solenoid
SP : Standard Play
S.S. : Start Sensor
SW : Switch
SYNC SEP : Sync Separator

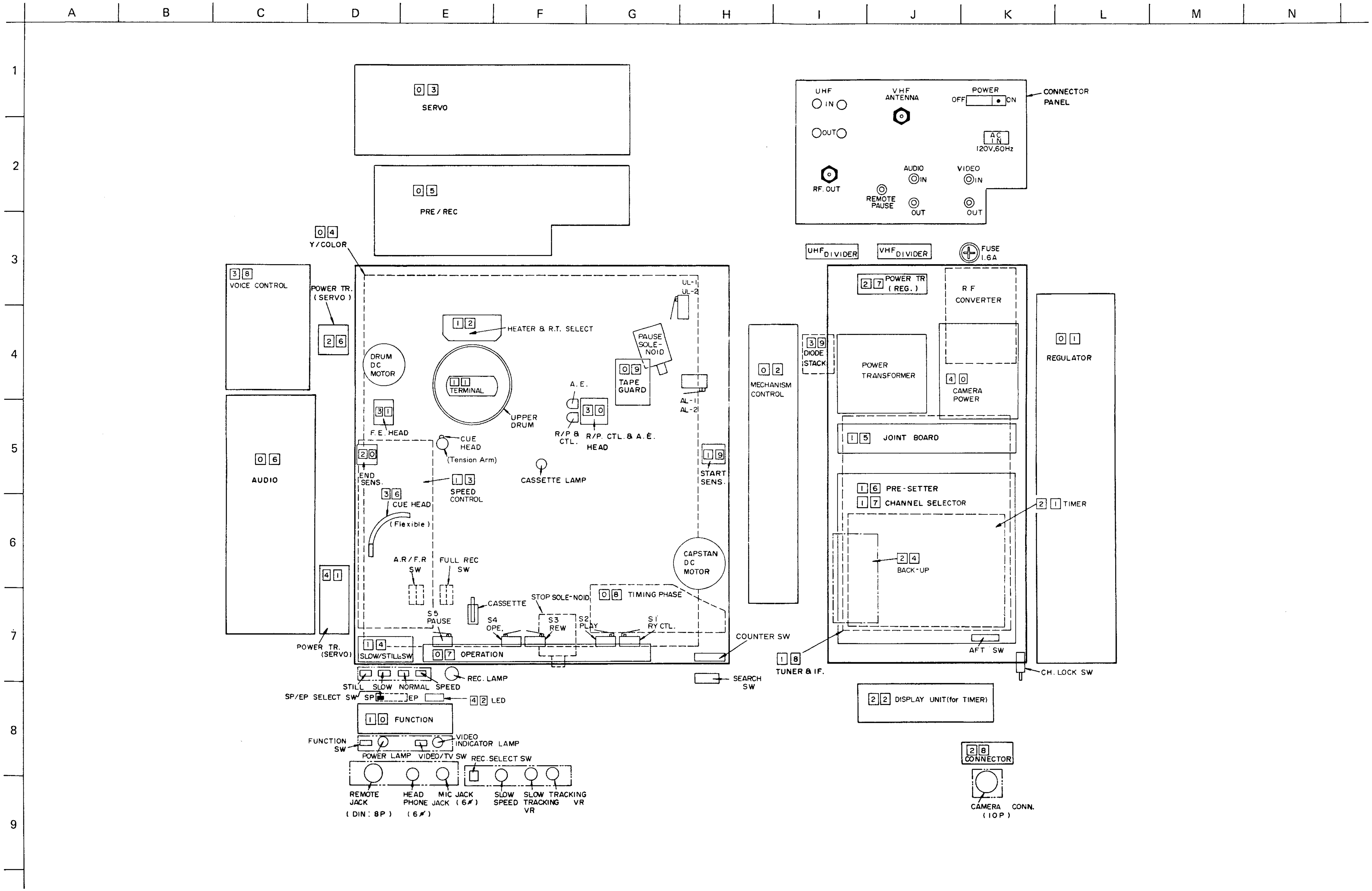
T. LEAD SW : Thermal Lead Switch
TR : Transistor

UL : Unloading

VC : Voice Control
VCO : Volage Controled Oscillator
V. Pulse : Vertical Pulse
VR : Variable Resistor
VXO : Variable Crystal Oscillator

Y/C : Luminance/Chrominance

8.2 ELECTRICAL PARTS LOCATIONS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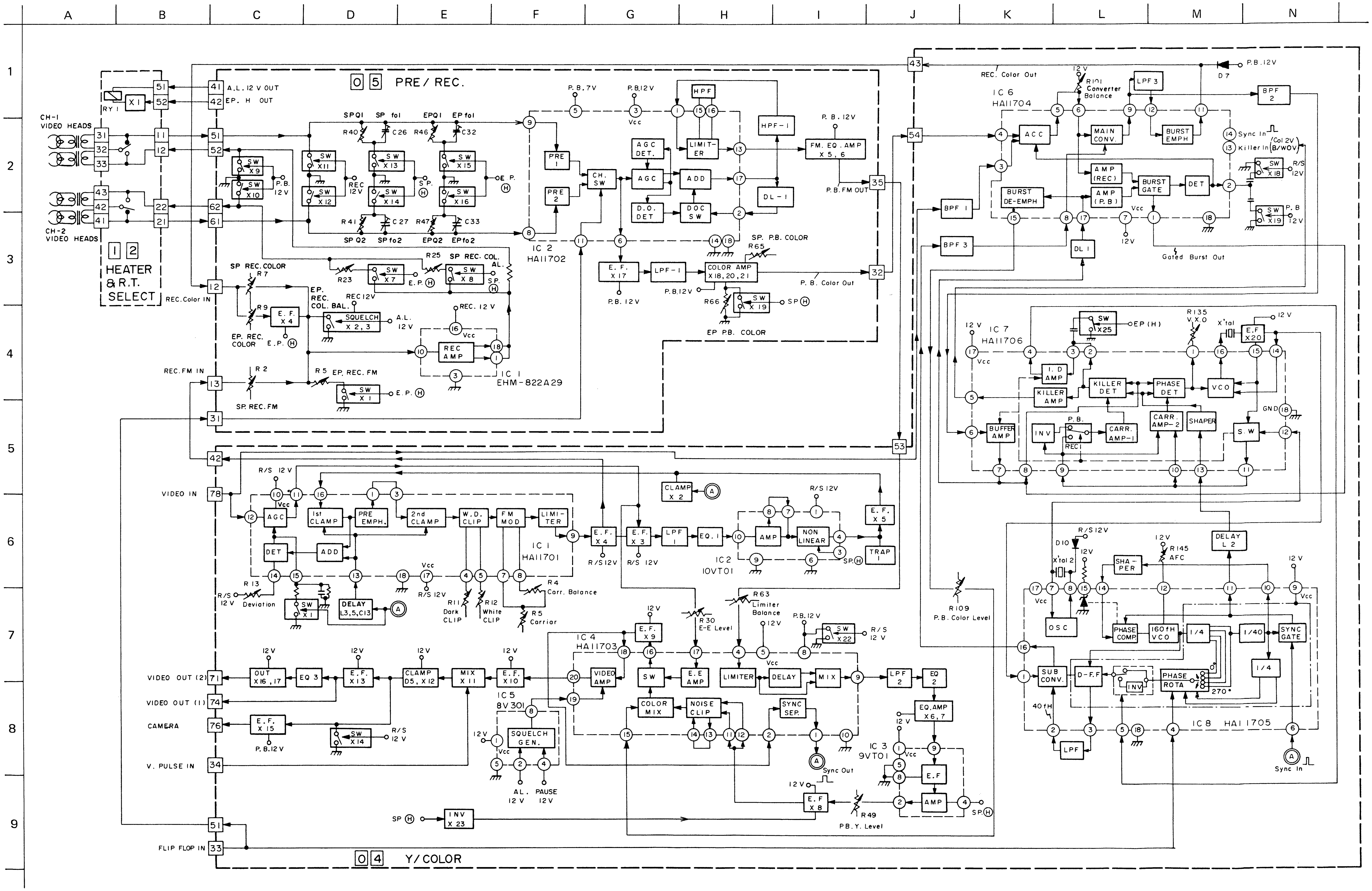
03 SERVO
05 PRE / REC
04 Y/COLOR
38 VOICE CONTROL
POWER TR. (SERVO)
26
06 AUDIO
41
POWER TR. (SERVO)
12 HEATER & R.T. SELECT
DRUM DC MOTOR
11 TERMINAL
UPPER DRUM
31 F.E. HEAD
20 END SENS.
CUE HEAD (Tension Arm)
13 SPEED CONTROL
36 CUE HEAD (Flexible)
CASSETTE LAMP
A.E.
R/P & CTL.
30 R/P. CTL. & A.E. HEAD
09 TAPE GUARD
PAUSE SOLE-NOID
UL-1
UL-2
AL-1
AL-2
19 START SENS.
CAPSTAN DC MOTOR
A.R/F.R SW
FULL REC SW
CASSETTE
STOP SOLE-NOID
08 TIMING PHASE
S5 PAUSE
S4 OPE.
S3 REW
S2 PLAY
S1 RY CTL.
14 SLOW/STILL SW
07 OPERATION
REC. LAMP
STILL
SLOW
NORMAL
SPEED
SP/EP SELECT SW
SP
EP
42 LED
10 FUNCTION
FUNCTION SW
POWER LAMP
VIDEO/TV SW
VIDEO INDICATOR LAMP
REC. SELECT SW
REMOTE JACK (DIN : 8P)
HEAD PHONE JACK (6⌀)
MIC JACK (6⌀)
SLOW SPEED
SLOW TRACKING VR
TRACKING VR
COUNTER SW
SEARCH SW
02 MECHANISM CONTROL
UHF
IN
OUT
VHF ANTENNA
POWER
OFF
ON
CONNECTOR PANEL
AC IN
120V,60Hz
RF. OUT
REMOTE PAUSE
AUDIO
IN
OUT
VIDEO
IN
OUT
UHF DIVIDER
VHF DIVIDER
FUSE 1.6A
27 POWER TR (REG.)
R F CONVERTER
39 DIODE STACK
POWER TRANSFORMER
40 CAMERA POWER
01 REGULATOR
15 JOINT BOARD
16 PRE-SETTER
17 CHANNEL SELECTOR
21 TIMER
24 BACK-UP
AFT SW
18 TUNER & IF.
CH. LOCK SW
22 DISPLAY UNIT(for TIMER)
28 CONNECTOR
CAMERA CONN. (10P)

8.3 VIDEO SYSTEM BLOCK DIAGRAM



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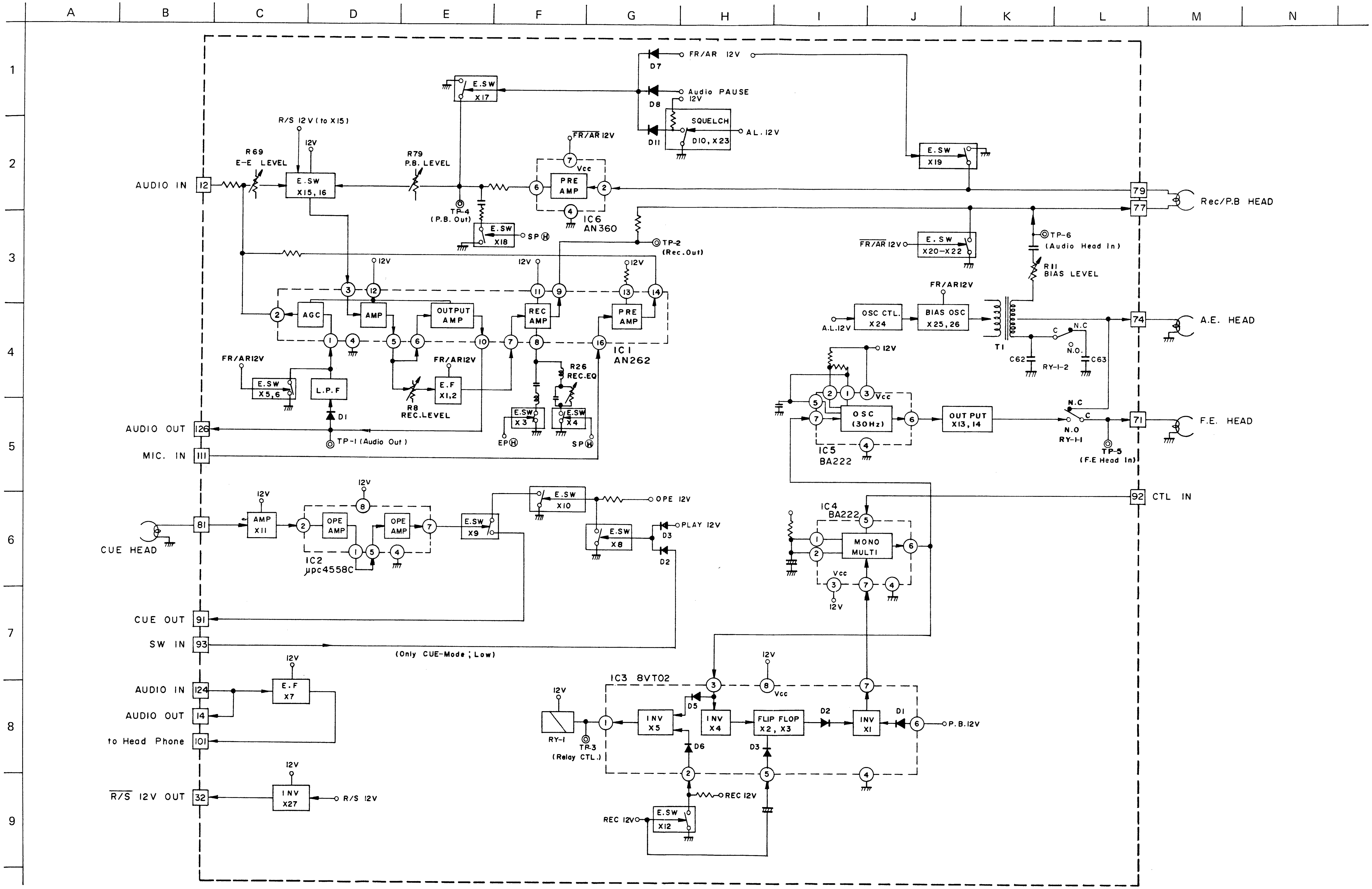
CH-1 VIDEO HEADS
CH-2 VIDEO HEADS
RY 1
X 1
HEATER & R.T. SELECT
A.L. 12 V OUT
EP. H OUT
05 PRE/REC.
SP Q1
SP fo1
EP Q1
EP fo1
SP Q2
SP fo2
EP Q2
EP fo2
R40
C26
R46
C32
R41
C27
R47
C33
SW X 9
SW X 10
SW X 11
SW X 12
SW X 13
SW X 14
SW X 15
SW X 16
REC 12V
P.B. 12V
SP. H
EP. H
R23
R25
SP REC. COL.
SW X 7
SW X 8
AL.
SP REC. COLOR R7
EP. REC. COL. BAL.
REC 12V
R9
E.F. X 4
SQUELCH X 2, 3
A.L. 12V
EP. REC. COLOR
E.P. H
REC. 12 V
REC AMP
IC 1 EHM-822A29
REC.FM IN
R 2
R 5 EP. REC. FM
SW X 1
SP. REC. FM
REC. Color IN
P.B.7V
P.B.12V
Vcc
HPF
LIMITER
HPF-1
PRE 1
PRE 2
CH. SW
AGC DET.
AGC
ADD
D.O. DET
DOC SW
DL-1
FM. EQ. AMP X 5, 6
P.B. FM OUT
IC 2 HA11702
E.F. X 17
LPF-1
COLOR AMP X18, 20, 21
SP. P.B. COLOR R65
P.B.12V
R66
SW X 19
SP H
EP P.B. COLOR
P.B. Color Out
P.B. 12V
REC. Color Out
12V R101 Converter Balance
LPF 3
D 7
P.B. 12V
BPF 2
IC 6 HA11704
ACC
MAIN CONV.
BURST EMPH
Sync In
Killer In (Col 2V B/W 0V)
SW X 18
R/S 12V
AMP (REC)
AMP (P.B)
BURST GATE
DET
BURST DE-EMPH
SW X 19
P.B 12V
BPF 1
BPF 3
DL 1
Gated Burst Out
IC 7 HA11706
SW X25
EP (H)
R135 V.X.O
X'tal
E.F X20
I.D AMP
KILLER AMP
KILLER DET
PHASE DET
VCO
GND
BUFFER AMP
INV
P.B.
REC
CARR. AMP-1
CARR. AMP-2
SHAPER
S.W
VIDEO IN
R/S 12V
AGC
1st CLAMP
PRE EMPH.
2nd CLAMP
W.D. CLIP
FM MOD
LIMITER
IC 1 HA11701
DET
ADD
R 13 Deviation
SW X 1
DELAY L3,5,C13
R/S 12V
R11 Dark CLIP
R12 White CLIP
R4 Carr. Balance
R5 Carrier
CLAMP X 2
E.F. X 4
E.F. X 3
LPF 1
EQ. 1
AMP
NON LINEAR
E.F. X 5
TRAP 1
IC 2 10VT01
R/S 12V
SP. H
R109 P.B. Color Level
R/S 12V
D10
X'tal 2
12V R145 AFC
SHAPER
DELAY L 2
OSC
PHASE COMP
160fH VCO
1/4
1/40
SYNC GATE
1/4
SUB CONV.
D-F.F
INV
PHASE ROTA
270°
40fH
LPF
IC 8 HA11705
Sync In
R63 Limiter Balance
R30 E-E Level
E.F. X 9
IC 4 HA11703
VIDEO AMP
SW
E.E AMP
LIMITER
DELAY
MIX
SW X22
R/S 12V
LPF 2
EQ 2
EQ. AMP X6, 7
COLOR MIX
NOISE CLIP
SYNC SEP.
Sync Out
IC 3 9VT01
E.F
AMP
E.F X 8
R49 P.B. Y. Level
VIDEO OUT (2)
VIDEO OUT (1)
CAMERA
V. PULSE IN
FLIP FLOP IN
OUT X16, 17
EQ 3
E.F. X13
CLAMP D5, X12
MIX X11
E.F. X10
IC 5 8V301
SQUELCH GEN.
AL. 12V
PAUSE 12V
E.F. X 15
P.B.12V
SW X 14
R/S 12V
SP H
INV X 23
04 Y/COLOR

8.4 AUDIO BLOCK DIAGRAM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AUDIO IN
12
R69
E-E LEVEL
R/S 12V (to X15)
12V
E.SW
X15, 16
R79
P.B. LEVEL
TP-4
(P.B. Out)
E.SW
X17
E.SW
X18
SP Ⓗ
FR/AR 12V
7
Vcc
6
PRE
AMP
2
4
IC6
AN360
D7
FR/AR 12V
D8
Audio PAUSE
12V
D11
SQUELCH
D10, X23
AL. 12V
E.SW
X19
79
77
Rec/P.B HEAD
TP-2
(Rec. Out)
FR/AR 12V
E.SW
X20-X22
TP-6
(Audio Head In)
R11
BIAS LEVEL
12V
3
12
12V
11
9
12V
13
14
2
AGC
AMP
OUTPUT
AMP
REC
AMP
PRE
AMP
1
4
5
6
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7
8
16
IC1
AN262
FR/AR12V
E.SW
X5, 6
L.P.F
D1
FR/AR12V
E.F
X1, 2
R8
REC.LEVEL
R26
REC.EQ
E.SW
X3
E.SW
X4
EP Ⓗ
SP Ⓗ
TP-1 (Audio Out)
AUDIO OUT
126
MIC. IN
111
FR/AR12V
A.L.12V
OSC CTL.
X24
BIAS OSC
X25, 26
T1
N.C
C
N.O.
C62
RY-1-2
C63
74
A.E. HEAD
12V
5
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3
Vcc
7
OSC
(30Hz)
6
4
IC5
BA222
OUT PUT
X13, 14
N.C
C
N.O
RY-1-1
TP-5
(F.E Head In)
71
F.E. HEAD
92
CTL IN
CUE HEAD
81
12V
AMP
X11
12V
8
2
OPE
AMP
OPE
AMP
7
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IC2
μpc4558C
E.SW
X9
E.SW
X10
OPE 12V
E.SW
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PLAY 12V
D3
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IC4
BA222
5
1
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MONO
MULTI
6
Vcc
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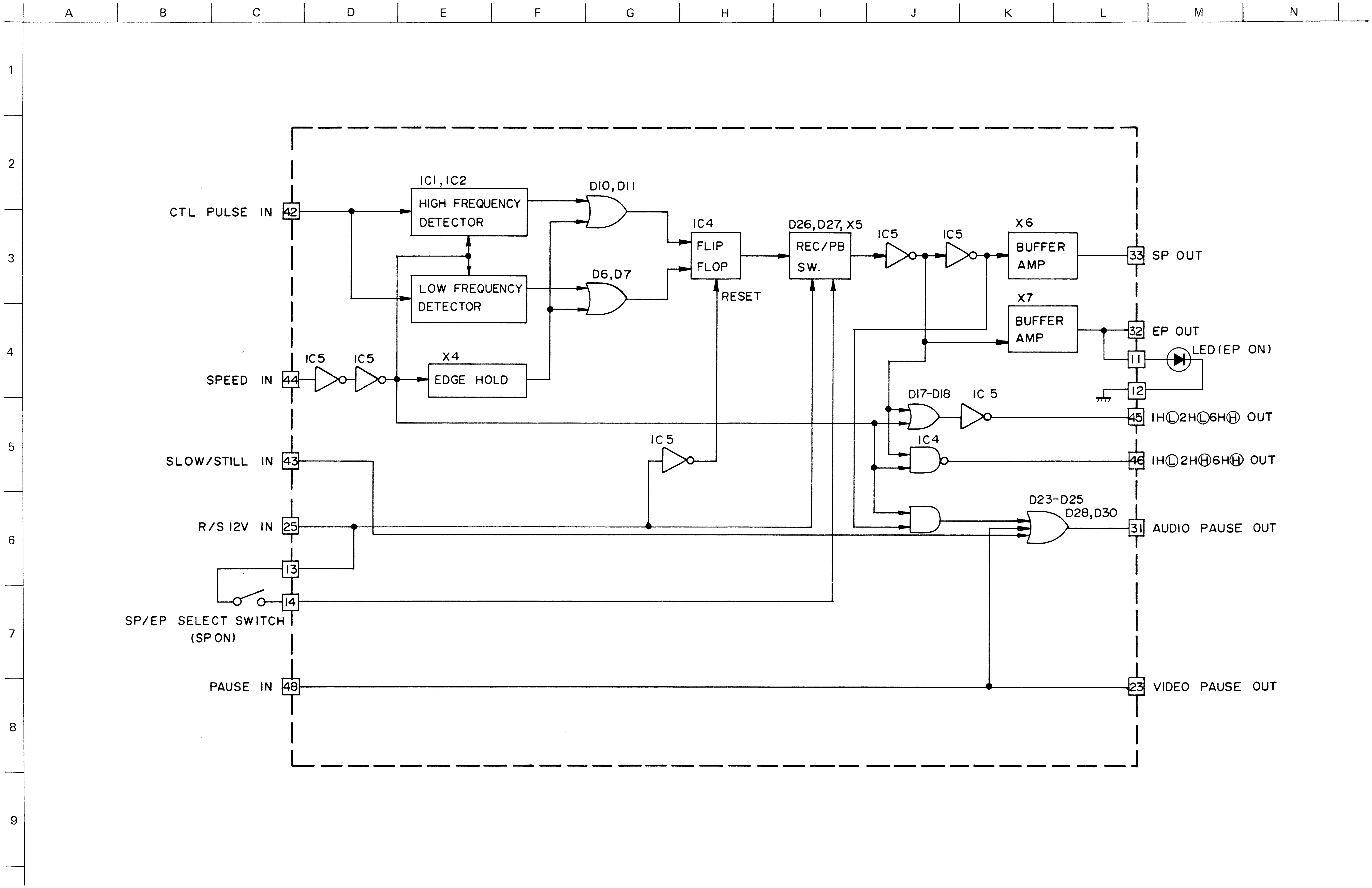
7
4
12V
CUE OUT
91
SW IN
93
(Only CUE-Mode ; Low)
AUDIO IN
124
12V
E.F
X7
AUDIO OUT
14
to Head Phone
101
IC3 8VT02
12V
RY-1
TP-3
(Relay CTL.)
1
INV
X5
D5
3
INV
X4
12V
8
Vcc
FLIP FLOP
X2, X3
D2
7
INV
X1
D1
6
P.B.12V
D6
D3
2
5
4
REC 12V
REC 12V
E.SW
X12
12V
INV
X27
R/S 12V
$\overline{R/S}$ 12V OUT
32

8.5 SPEED CONTROL BLOCK DIAGRAM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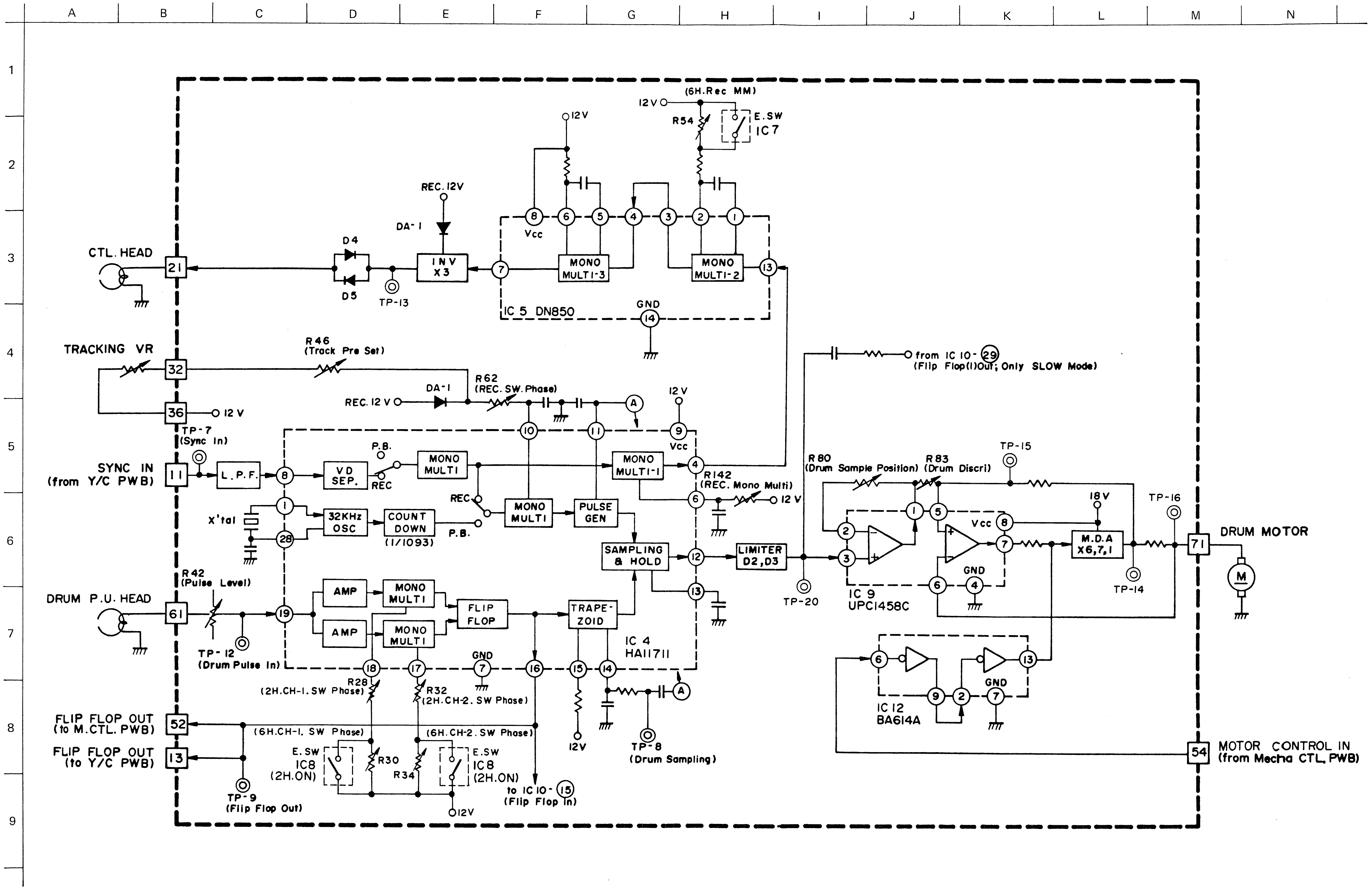
IC1, IC2
HIGH FREQUENCY DETECTOR
LOW FREQUENCY DETECTOR
D10, D11
D6, D7
IC4
FLIP FLOP
RESET
D26, D27, X5
REC/PB SW.
IC5
IC5
X6
BUFFER AMP
X7
BUFFER AMP
33
SP OUT
32
EP OUT
11
LED (EP ON)
12
CTL PULSE IN
42
SPEED IN
44
IC5
IC5
X4
EDGE HOLD
D17-D18
IC 5
45
1H Ⓛ 2H Ⓛ 6H Ⓗ OUT
IC4
46
1H Ⓛ 2H Ⓗ 6H Ⓗ OUT
SLOW/STILL IN
43
IC5
R/S 12V IN
25
D23-D25
D28, D30
31
AUDIO PAUSE OUT
13
14
SP/EP SELECT SWITCH
(SP ON)
PAUSE IN
48
23
VIDEO PAUSE OUT

8.6 DRUM SERVO BLOCK DIAGRAM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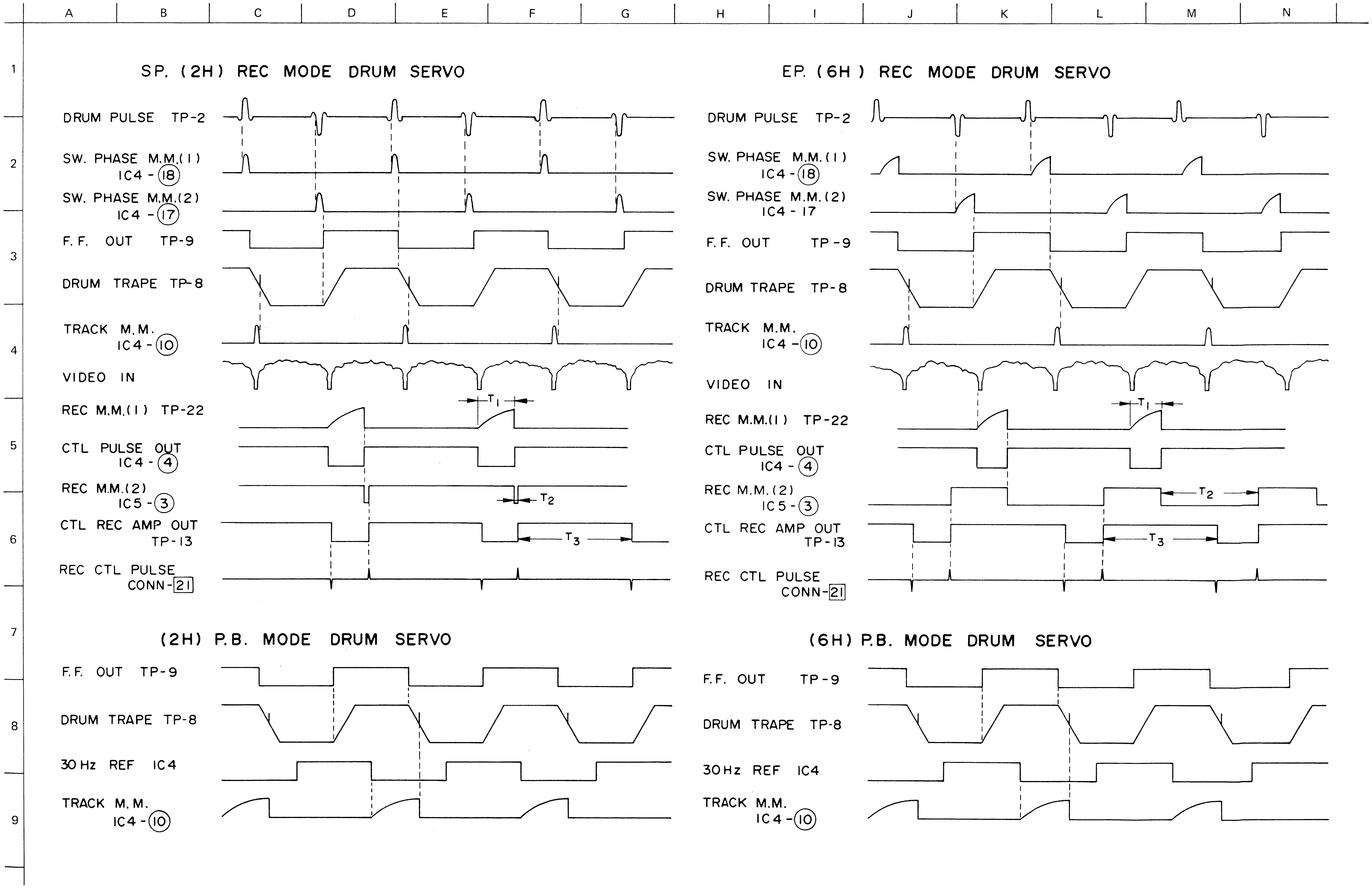
(6H.Rec MM)
12V
R54
E.SW
IC7
12V
REC. 12V
DA-1
D4
D5
TP-13
INV
X3
8
Vcc
6
5
4
3
2
1
7
MONO MULTI-3
MONO MULTI-2
13
IC 5 DN850
GND
14
CTL. HEAD
21
TRACKING VR
32
R46
(Track Pre Set)
36
12 V
DA-1
R62
(REC. SW. Phase)
REC. 12 V
A
12 V
9
Vcc
10
11
from IC 10-29
(Flip Flop(1)Out; Only SLOW Mode)
TP-7
(Sync In)
SYNC IN
(from Y/C PWB)
11
L.P.F.
8
VD SEP.
P.B.
REC
MONO MULTI
MONO MULTI-1
4
R142
(REC. Mono Multi)
6
12 V
REC
MONO MULTI
PULSE GEN
1
X'tal
28
32KHz OSC
COUNT DOWN
(1/1093)
P.B.
SAMPLING & HOLD
12
LIMITER D2,D3
13
R80
(Drum Sample Position)
R83
(Drum Discri)
TP-15
18V
TP-16
Vcc
8
7
M.D.A
X6,7,1
71
DRUM MOTOR
M
GND
4
TP-14
TP-20
IC 9
UPC1458C
R42
(Pulse Level)
DRUM P.U. HEAD
61
19
AMP
AMP
MONO MULTI
MONO MULTI
FLIP FLOP
TRAPE-ZOID
IC 4
HA11711
TP-12
(Drum Pulse In)
18
17
GND
7
16
15
14
R28
(2H.CH-1. SW Phase)
R32
(2H.CH-2. SW Phase)
A
FLIP FLOP OUT
(to M.CTL. PWB)
52
FLIP FLOP OUT
(to Y/C PWB)
13
(6H.CH-1. SW Phase)
(6H.CH-2. SW Phase)
E.SW
IC8
(2H.ON)
R30
R34
E.SW
IC8
(2H.ON)
12V
TP-8
(Drum Sampling)
TP-9
(Flip Flop Out)
12V
to IC 10-15
(Flip Flop In)
6
13
9
2
GND
7
IC 12
BA614A
54
MOTOR CONTROL IN
(from Mecha CTL. PWB)

8.7 DRUM SERVO TIMING CHART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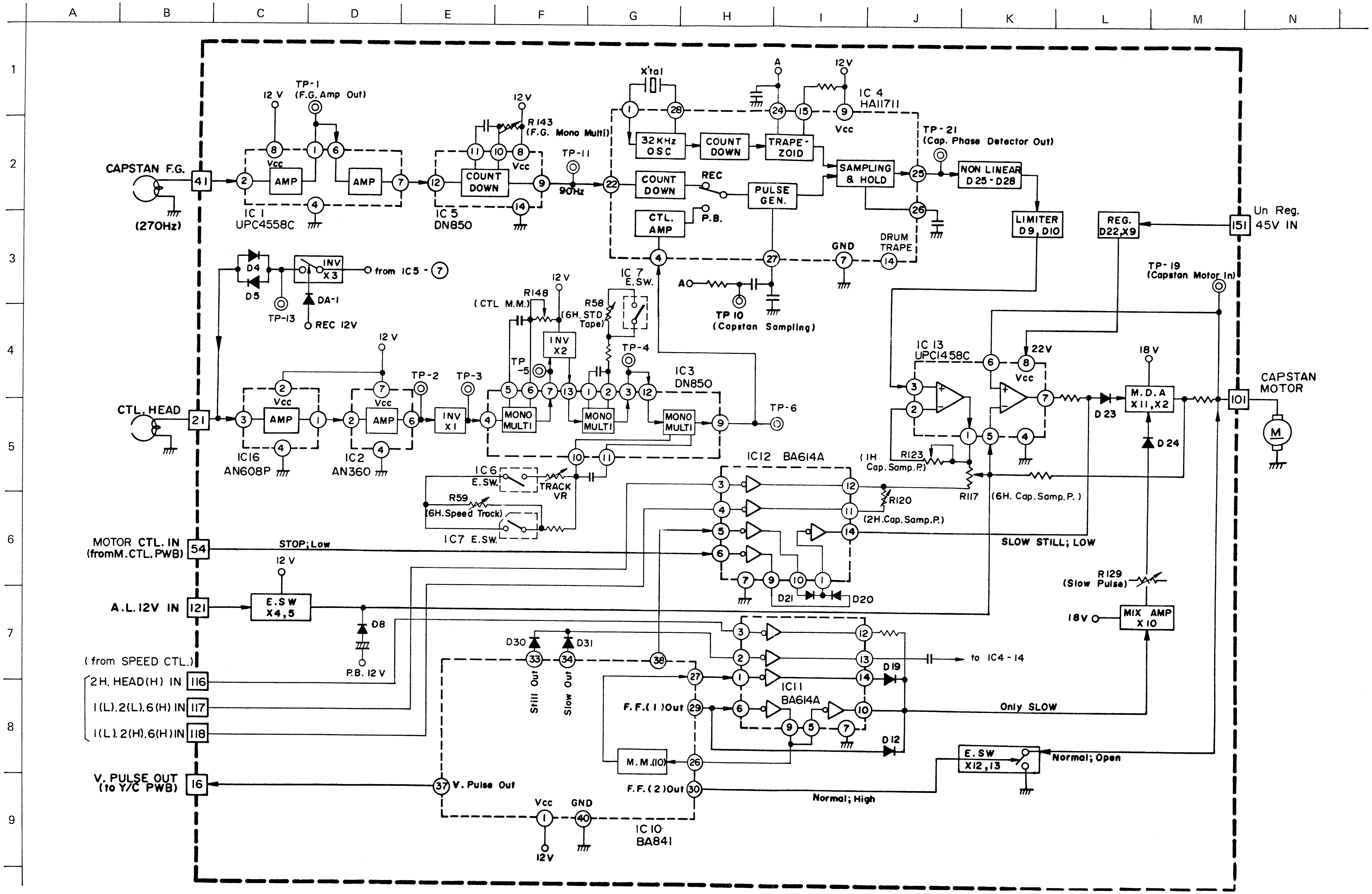
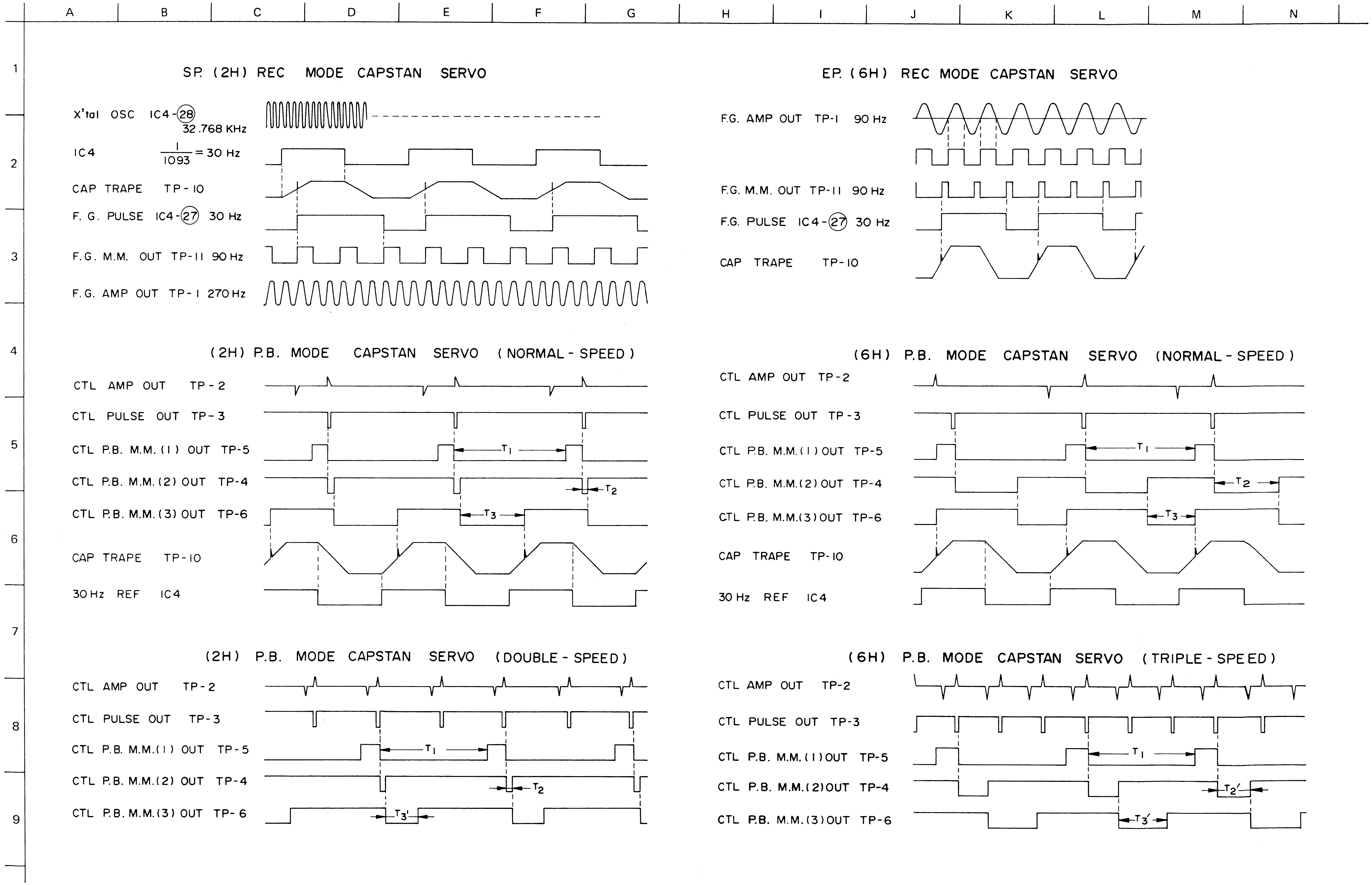
SP. (2H) REC MODE DRUM SERVO
DRUM PULSE TP-2
SW. PHASE M.M.(1) IC4 - ⑱
SW. PHASE M.M.(2) IC4 - ⑰
F. F. OUT TP-9
DRUM TRAPE TP-8
TRACK M.M. IC4 - ⑩
VIDEO IN
REC M.M.(1) TP-22
T_1
CTL PULSE OUT IC4 - ④
REC M.M.(2) IC5 - ③
T_2
CTL REC AMP OUT TP-13
T_3
REC CTL PULSE CONN-21
EP. (6H) REC MODE DRUM SERVO
DRUM PULSE TP-2
SW. PHASE M.M.(1) IC4 - ⑱
SW. PHASE M.M.(2) IC4 - 17
F. F. OUT TP-9
DRUM TRAPE TP-8
TRACK M.M. IC4 - ⑩
VIDEO IN
REC M.M.(1) TP-22
T_1
CTL PULSE OUT IC4 - ④
REC M.M.(2) IC5 - ③
T_2
CTL REC AMP OUT TP-13
T_3
REC CTL PULSE CONN-21
(2H) P.B. MODE DRUM SERVO
F.F. OUT TP-9
DRUM TRAPE TP-8
30 Hz REF IC4
TRACK M.M. IC4 - ⑩
(6H) P.B. MODE DRUM SERVO
F.F. OUT TP-9
DRUM TRAPE TP-8
30 Hz REF IC4
TRACK M.M. IC4 - ⑩

8.8 CAPSTAN SERVO BLOCK DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
CAPSTAN F.G.
(270Hz)
41
12 V
TP-1
(F.G. Amp Out)
Vcc
AMP
AMP
IC 1
UPC4558C
12V
R 143
(F.G. Mono Multi)
COUNT DOWN
Vcc
IC 5
DN850
TP-11
90Hz
X'tal
32 KHz OSC
COUNT DOWN
TRAPE-ZOID
A
12V
IC 4
HA11711
Vcc
COUNT DOWN
REC
PULSE GEN.
SAMPLING & HOLD
CTL. AMP
P.B.
GND
DRUM TRAPE
TP-21
(Cap. Phase Detector Out)
NON LINEAR
D 25 - D28
LIMITER
D9, D10
REG.
D22,X9
Un Reg.
45V IN
151
TP 10
(Capstan Sampling)
INV X3
from IC5 - ⑦
D4
D5
TP-13
DA-1
REC 12V
12 V
R148
(CTL M.M.)
(6H. STD Tape)
R58
IC 7
E.SW.
INV X2
TP-5
TP-4
IC3
DN850
TP-19
(Capstan Motor In)
CTL. HEAD
21
12 V
Vcc
AMP
Vcc
AMP
TP-2
TP-3
INV X1
MONO MULTI
MONO MULTI
MONO MULTI
TP-6
IC16
AN608P
IC2
AN360
IC 13
UPC1458C
22V
Vcc
18 V
M.D.A
X11, X2
D 23
D 24
CAPSTAN MOTOR
101
M
IC6
E.SW.
TRACK VR
R59
(6H. Speed Track)
IC7 E.SW.
IC12 BA614A
(1H Cap. Samp. P.)
R123
R117
(6H. Cap. Samp. P.)
R120
(2H. Cap. Samp. P.)
MOTOR CTL. IN
(from M. CTL. PWB)
54
STOP; Low
SLOW STILL; LOW
D21
D20
12 V
A.L. 12V IN
121
E.SW
X4,5
D8
P.B. 12 V
R129
(Slow Pulse)
18V
MIX AMP
X 10
(from SPEED CTL.)
2H. HEAD(H) IN
116
1(L). 2(L). 6(H) IN
117
1(L). 2(H). 6(H) IN
118
D30
D31
Still Out
Slow Out
to IC4 - 14
D19
IC11
BA614A
F.F.(1)Out
Only SLOW
D 12
M.M.(10)
E.SW
X12, 13
Normal; Open
V. PULSE OUT
(to Y/C PWB)
16
V. Pulse Out
F.F.(2)Out
Normal; High
Vcc
GND
IC 10
BA841
12V

8.9 CAPSTAN SERVO TIMING CHART


A
B
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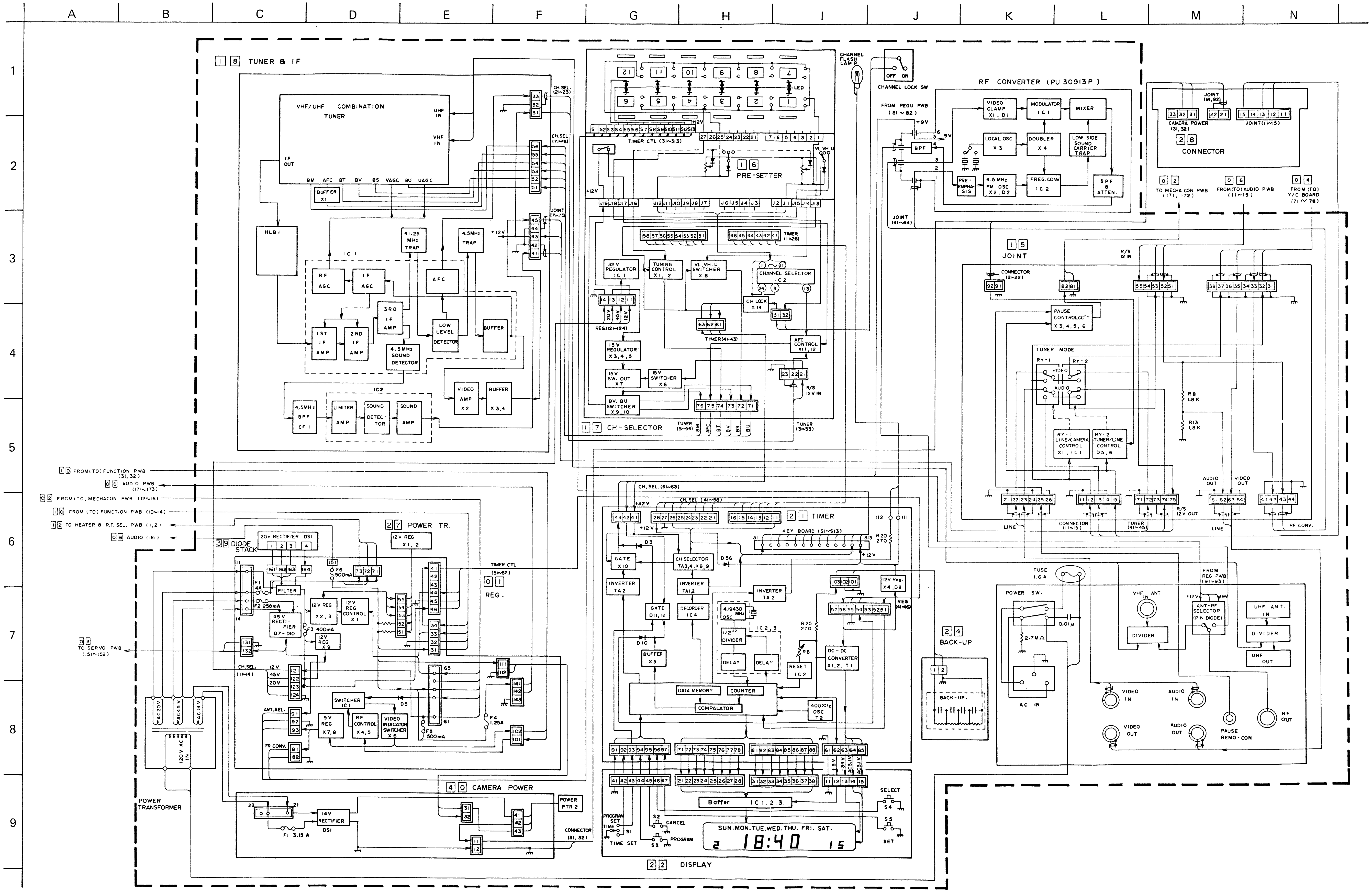
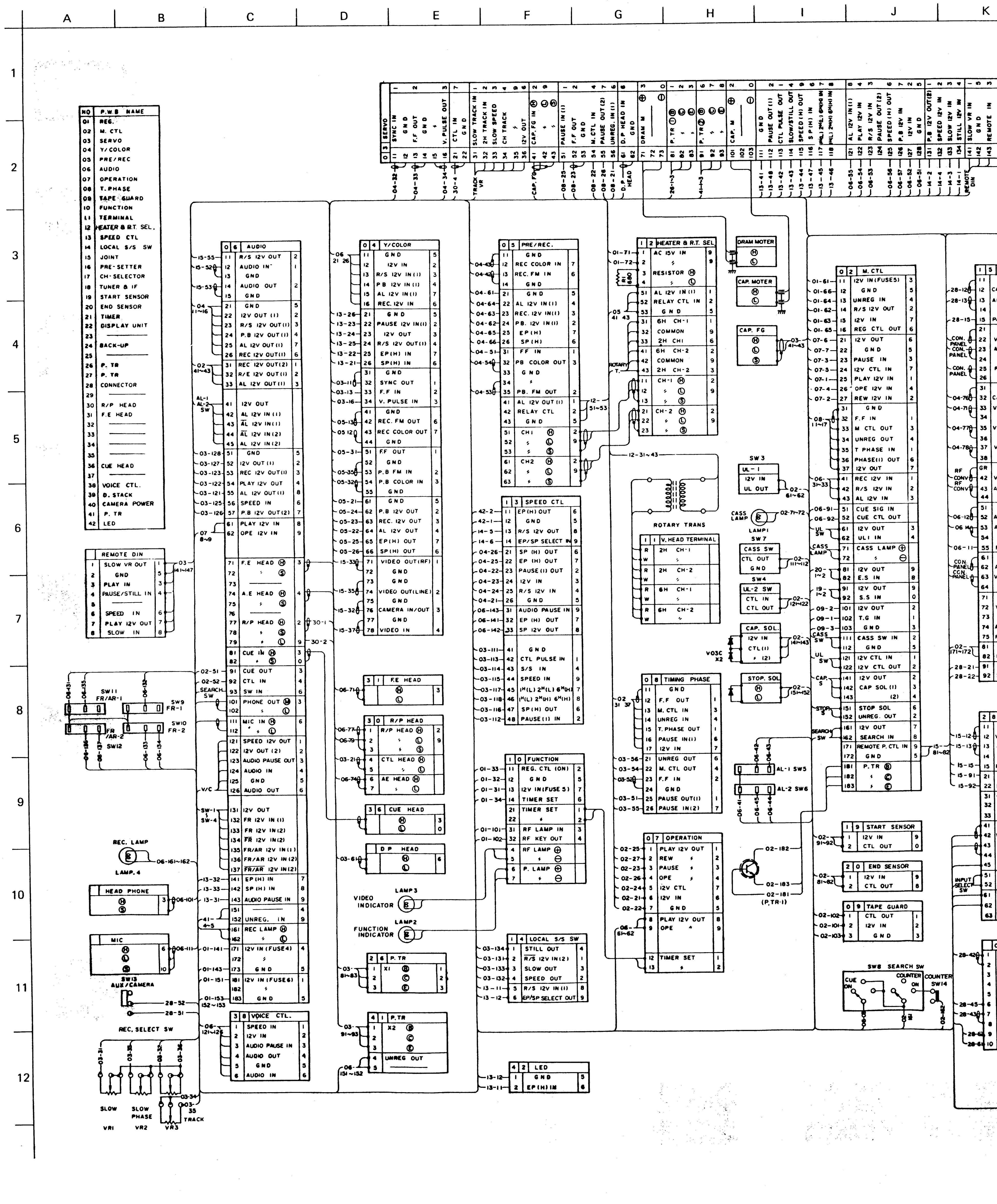
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
SP. (2H) REC MODE CAPSTAN SERVO
X'tal OSC IC4-㉘ 32.768 KHz
IC4 1/1093 = 30 Hz
CAP TRAPE TP-10
F. G. PULSE IC4-㉗ 30 Hz
F.G. M.M. OUT TP-11 90 Hz
F.G. AMP OUT TP-1 270 Hz
EP. (6H) REC MODE CAPSTAN SERVO
F.G. AMP OUT TP-1 90 Hz
F.G. M.M. OUT TP-11 90 Hz
F.G. PULSE IC4-㉗ 30 Hz
CAP TRAPE TP-10
(2H) P.B. MODE CAPSTAN SERVO (NORMAL-SPEED)
CTL AMP OUT TP-2
CTL PULSE OUT TP-3
CTL P.B. M.M. (1) OUT TP-5
CTL P.B. M.M. (2) OUT TP-4
CTL P.B. M.M. (3) OUT TP-6
CAP TRAPE TP-10
30 Hz REF IC4
T1
T2
T3
(6H) P.B. MODE CAPSTAN SERVO (NORMAL-SPEED)
CTL AMP OUT TP-2
CTL PULSE OUT TP-3
CTL P.B. M.M. (1) OUT TP-5
CTL P.B. M.M. (2) OUT TP-4
CTL P.B. M.M. (3) OUT TP-6
CAP TRAPE TP-10
30 Hz REF IC4
T1
T2
T3
(2H) P.B. MODE CAPSTAN SERVO (DOUBLE-SPEED)
CTL AMP OUT TP-2
CTL PULSE OUT TP-3
CTL P.B. M.M. (1) OUT TP-5
CTL P.B. M.M. (2) OUT TP-4
CTL P.B. M.M. (3) OUT TP-6
T1
T2
T3'
(6H) P.B. MODE CAPSTAN SERVO (TRIPLE-SPEED)
CTL AMP OUT TP-2
CTL PULSE OUT TP-3
CTL P.B. M.M. (1) OUT TP-5
CTL P.B. M.M. (2) OUT TP-4
CTL P.B. M.M. (3) OUT TP-6
T1
T2'
T3'

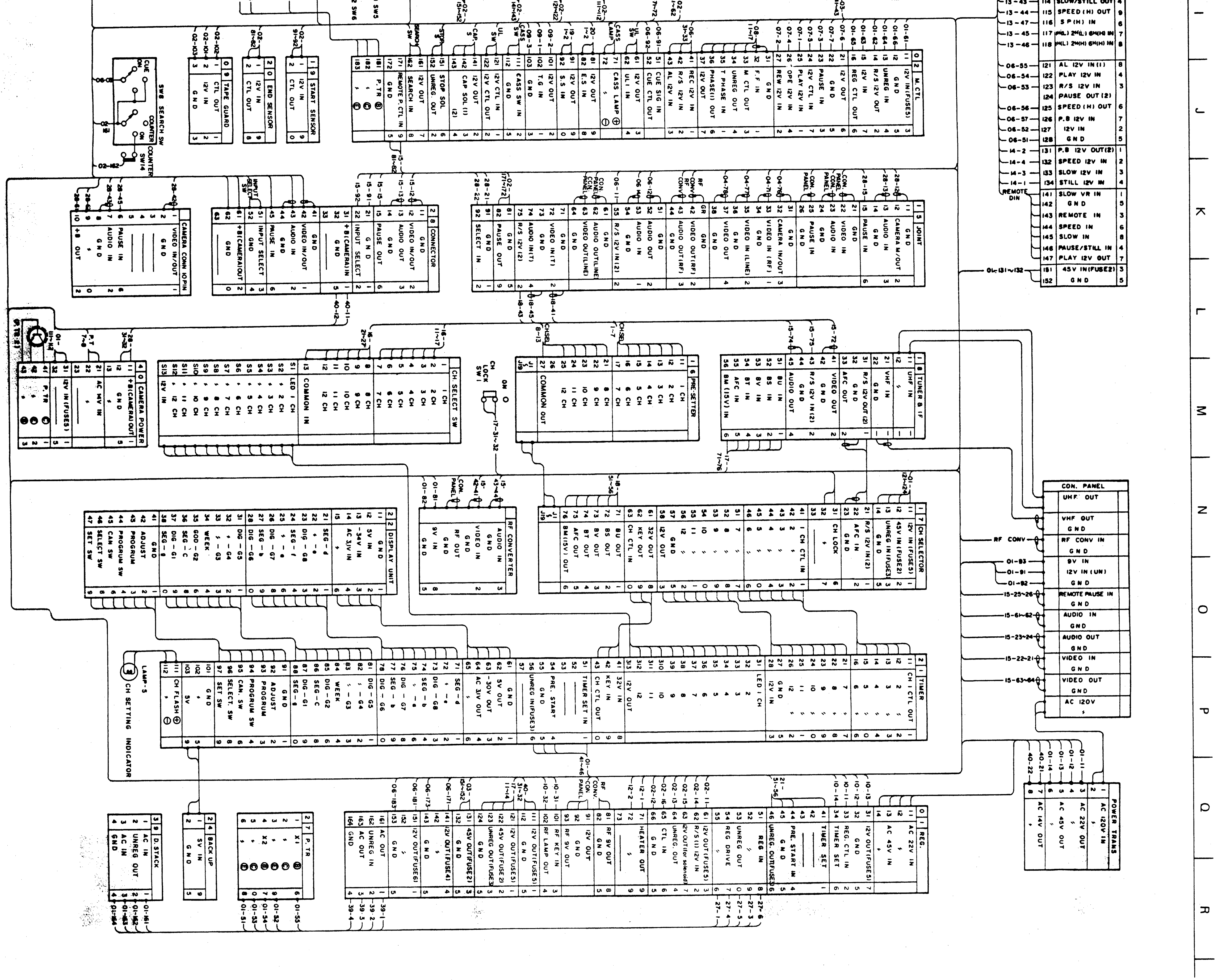
8.10 TUNER UNIT BLOCK DIAGRAM



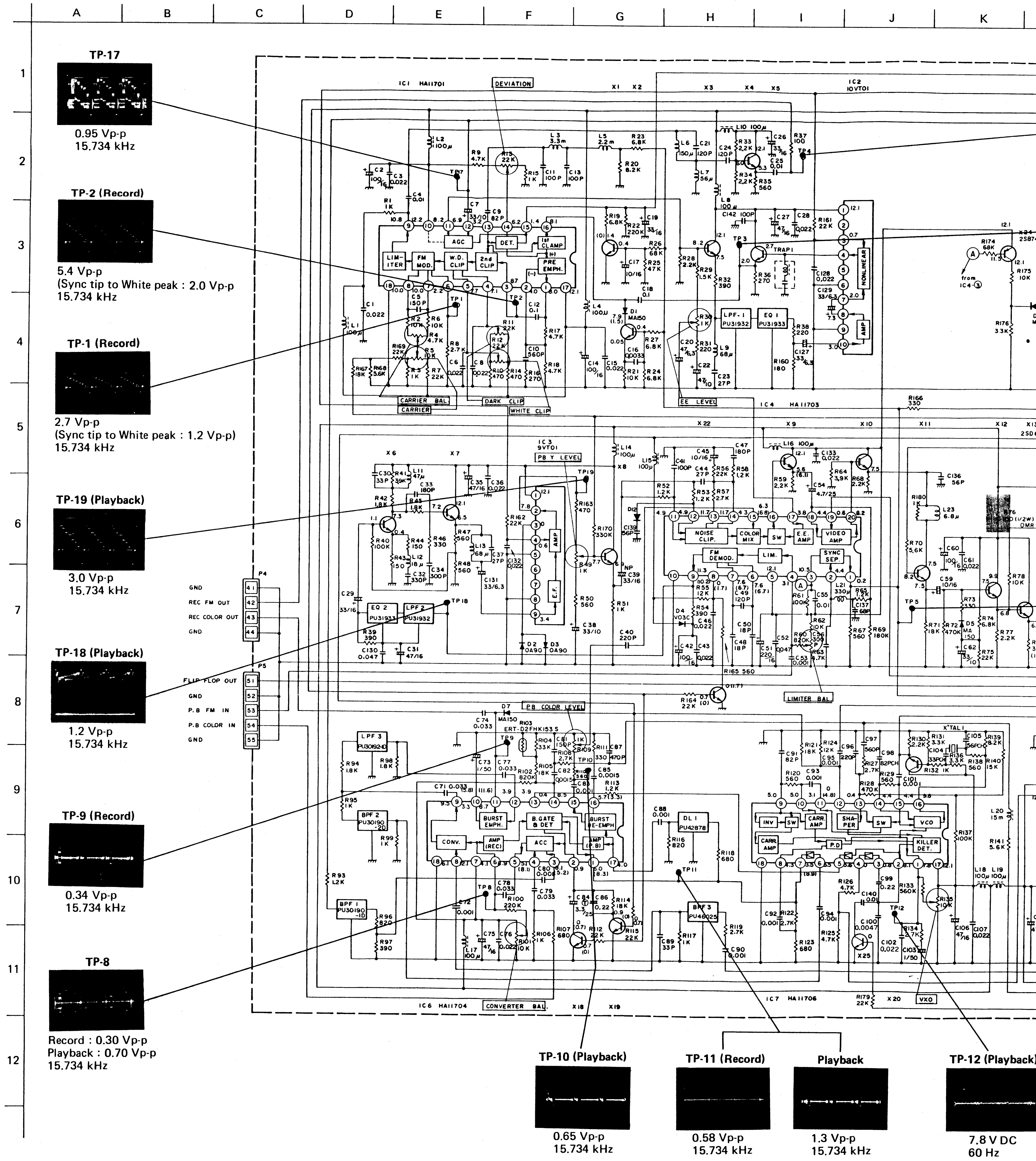
A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
18 TUNER & IF
VHF/UHF COMBINATION TUNER
UHF IN
VHF IN
IF OUT
BM AFC BT BV BS VAGC BU UAGC
BUFFER X1
HLB1
IC1
RF AGC
IF AGC
1ST IF AMP
2ND IF AMP
3RD IF AMP
41.25 MHz TRAP
4.5MHz TRAP
AFC
LOW LEVEL DETECTOR
BUFFER
4.5MHz SOUND DETECTOR
IC2
4.5MHz BPF CF1
LIMITER AMP
SOUND DETECTOR
SOUND AMP
VIDEO AMP X2
BUFFER X3,4
CH.SEL (21~23)
CH.SEL (71~76)
JOINT (41~45)
+12V
CHANNEL FLASH LAMP
CHANNEL LOCK SW
OFF ON
LED
TIMER CTL (31~313)
16 PRE-SETTER
VL VH U
+12V
TIMER (41~28)
32V REGULATOR IC1
TUNING CONTROL X1, 2
VL VH U SWITCHER X8
CHANNEL SELECTOR IC2
CH LOCK X14
REG(12~24)
TIMER(41~43)
15V REGULATOR X3,4,5
15V SW. OUT X7
15V SWITCHER X6
AFC CONTROL X11, 12
BV. BU SWITCHER X9, 10
R/S 12V IN
17 CH-SELECTOR
TUNER (51~56)
BM AFC BT BV BS BU
TUNER (31~33)
RF CONVERTER (PU 30913P)
FROM PEGU PWB (81~82)
+9V
9V
BPF
VIDEO CLAMP X1, D1
MODULATOR IC1
MIXER
LOCAL OSC X3
DOUBLER X4
LOW SIDE SOUND CARRIER TRAP
PRE-EMPHA-SIS
4.5 MHz FM OSC X2, D2
FREQ.CONV IC2
BPF & ATTEN.
JOINT (41~44)
JOINT (91,92)
CAMERA POWER (31, 32)
JOINT (11~15)
28 CONNECTOR
02 TO MECHA CON PWB (171, 172)
06 FROM(TO) AUDIO PWB (11~15)
04 FROM (TO) Y/C BOARD (71~78)
15 JOINT
CONNECTOR (21~22)
R/S 12 IN
PAUSE CONTROL CC'T X3,4,5,6
TUNER MODE
RY-1 RY-2
VIDEO AUDIO
R8 1.8K
R13 1.8K
RY-1 LINE/CAMERA CONTROL X1, IC1
RY-2 TUNER/LINE CONTROL D5, 6
AUDIO OUT
VIDEO OUT
LINE
CONNECTOR (11~15)
TUNER (41~45)
R/S 12V OUT
LINE
RF CONV.
10 FROM (TO) FUNCTION PWB (31, 32)
06 AUDIO PWB (171~173)
02 FROM(TO) MECHACON PWB (12~16)
10 FROM (TO) FUNCTION PWB (10~14)
12 TO HEATER & R.T. SEL. PWB (1, 2)
06 AUDIO (181)
39 DIODE STACK
20V RECTIFIER DS1
27 POWER TR.
12V REG X1, 2
F1 4A
F2 250mA
FILTER
F6 500mA
45V RECTIFIER D7~D10
12V REG X2, 3
12V REG CONTROL X1
F3 400mA
12V REG X9
01 REG.
TIMER CTL (51~57)
03 TO SERVO PWB (151~152)
CH.SEL. (11~14)
12 V 45V 20V
ANT.SEL.
SWITCHER IC1
D5
9V REG X7, 8
RF CONTROL X4, 5
VIDEO INDICATOR SWITCHER X6
F5 500mA
F4 1.25A
FR CONV.
AC20V AC45V AC14V
120V AC IN
POWER TRANSFORMER
14V RECTIFIER DS1
F1 3.15 A
40 CAMERA POWER
POWER PTR 2
CONNECTOR (31, 32)
CH.SEL.(61~63)
CH.SEL.(41~58)
+32V
21 TIMER
KEY BOARD (S1~S13)
R20 270
+12V
D3
GATE X10
CH.SELECTOR TA3,4,X8,9
D56
INVERTER TA2
INVERTER TA1,2
INVERTER TA2
12V Reg. X4, D8
REG (41~46)
GATE D11, 12
DECORDER IC4
4.19430 MHz OSC
1/2^22 DIVIDER
IC2, 3
DELAY
R25 270
R8
RESET IC2
DC-DC CONVERTER X1, 2. T1
D10
BUFFER X5
DATA MEMORY
COUNTER
COMPALATOR
400KHz OSC T2
24 BACK-UP
BACK-UP
FUSE 1.6A
POWER SW.
0.01μ
2.7MΩ
AC IN
VHF ANT IN
DIVIDER
FROM REG PWB (91~93)
+12V 9V
ANT-RF SELECTOR (PIN DIODE)
UHF ANT. IN
DIVIDER
UHF OUT
VIDEO IN
AUDIO IN
VIDEO OUT
AUDIO OUT
PAUSE REMO-CON
RF OUT
Buffer IC1.2.3.
SELECT S4
S5 SET
PROGRAM SET TIME S1
TIME SET
S2 CANCEL
S3 PROGRAM
SUN.MON.TUE.WED.THU. FRI. SAT.
2 18:40 15
22 DISPLAY

8.11 OVERALL WIRING


NO P.W.B NAME
01 REG.
02 M. CTL
03 SERVO
04 Y/COLOR
05 PRE/REC
06 AUDIO
07 OPERATION
08 T. PHASE
09 TAPE GUARD
10 FUNCTION
11 TERMINAL
12 HEATER & R.T. SEL.
13 SPEED CTL
14 LOCAL S/S SW
15 JOINT
16 PRE-SETTER
17 CH-SELECTOR
18 TUNER & IF
19 START SENSOR
20 END SENSOR
21 TIMER
22 DISPLAY UNIT
24 BACK-UP
26 P. TR
27 P. TR
28 CONNECTOR
30 R/P HEAD
31 F.E HEAD
36 CUE HEAD
38 VOICE CTL.
39 D. STACK
40 CAMERA POWER
41 P. TR
42 LED
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
9
10
11
12
REMOTE DIN
ROTARY TRANS
REC. SELECT SW
SW13 AUX/CAMERA
SW8 SEARCH SW
REC. LAMP
LAMP. 4
HEAD PHONE
MIC
DRAM MOTER
CAP. MOTER
CAP. FG
VIDEO INDICATOR LAMP3
FUNCTION INDICATOR LAMP2


M. CTL
TAPE GUARD
END SENSOR
START SENSOR
SW8 SEARCH SW
COUNTER SW14
CAMERA CONN 10PIN
CONNECTOR
JOINT
REMOTE DIN
CAMERA POWER
CH SELECT SW
CH LOCK SW1
PRE-SETTER
TUNER & IF
CON. PANEL
DISPLAY UNIT
RF CONVERTER
CH SELECTOR
TIMER
CH SETTING INDICATOR
LAMP-5
POWER TRANS
D. STACK
BACK UP
P. TR
REG.
J
K
L
M
N
O
P
Q
R

8.12 LUMINANCE AND CHROMINANCE (Y/C) CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
9
10
11
12
IC1 HA11701
IC2 10VT01
IC3 9VT01
IC4 HA11703
IC6 HA11704
IC7 HA11706
DEVIATION
CARRIER BAL
CARRIER
DARK CLIP
WHITE CLIP
EE LEVEL
PB Y LEVEL
PB COLOR LEVEL
LIMITER BAL
CONVERTER BAL
VXO
LIM-ITER
FM MOD.
W.D. CLIP
2nd CLIP
AGC
DET.
1st CLAMP
PRE EMPH.
NONLINEAR
AMP
LPF-1 PU31932
EQ 1 PU31933
TRAP1
EQ 2 PU31933
LPF 2 PU31932
E.F.
NOISE CLIP.
COLOR MIX
SW
E.E. AMP
VIDEO AMP
FM DEMOD.
LIM.
SYNC SEP.
LPF 3 PU30924D
BPF 2 PU30190-20
BPF 1 PU30190-10
BPF 3 PU46025
DL 1 PU42878
CONV.
AMP (REC)
BURST EMPH.
B.GATE & DET
ACC
BURST DE-EMPH
AMP (P.B)
INV
CARR AMP
SHA-PER
VCO
KILLER DET.
P.D
X'TAL 1
P4
GND
REC FM OUT
REC COLOR OUT
GND
P5
FLIP FLOP OUT
GND
P.B FM IN
P.B COLOR IN
GND
TP1
TP2
TP3
TP4
TP5
TP7
TP8
TP9
TP10
TP11
TP12
TP18
TP19
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X18
X19
X20
X22
X25
from IC4-③

TP-17
0.95 Vp-p
15.734 kHz

TP-2 (Record)
5.4 Vp-p
(Sync tip to White peak : 2.0 Vp-p
15.734 kHz

TP-1 (Record)
2.7 Vp-p
(Sync tip to White peak : 1.2 Vp-p)
15.734 kHz

TP-19 (Playback)
3.0 Vp-p
15.734 kHz

TP-18 (Playback)
1.2 Vp-p
15.734 kHz

TP-9 (Record)
0.34 Vp-p
15.734 kHz

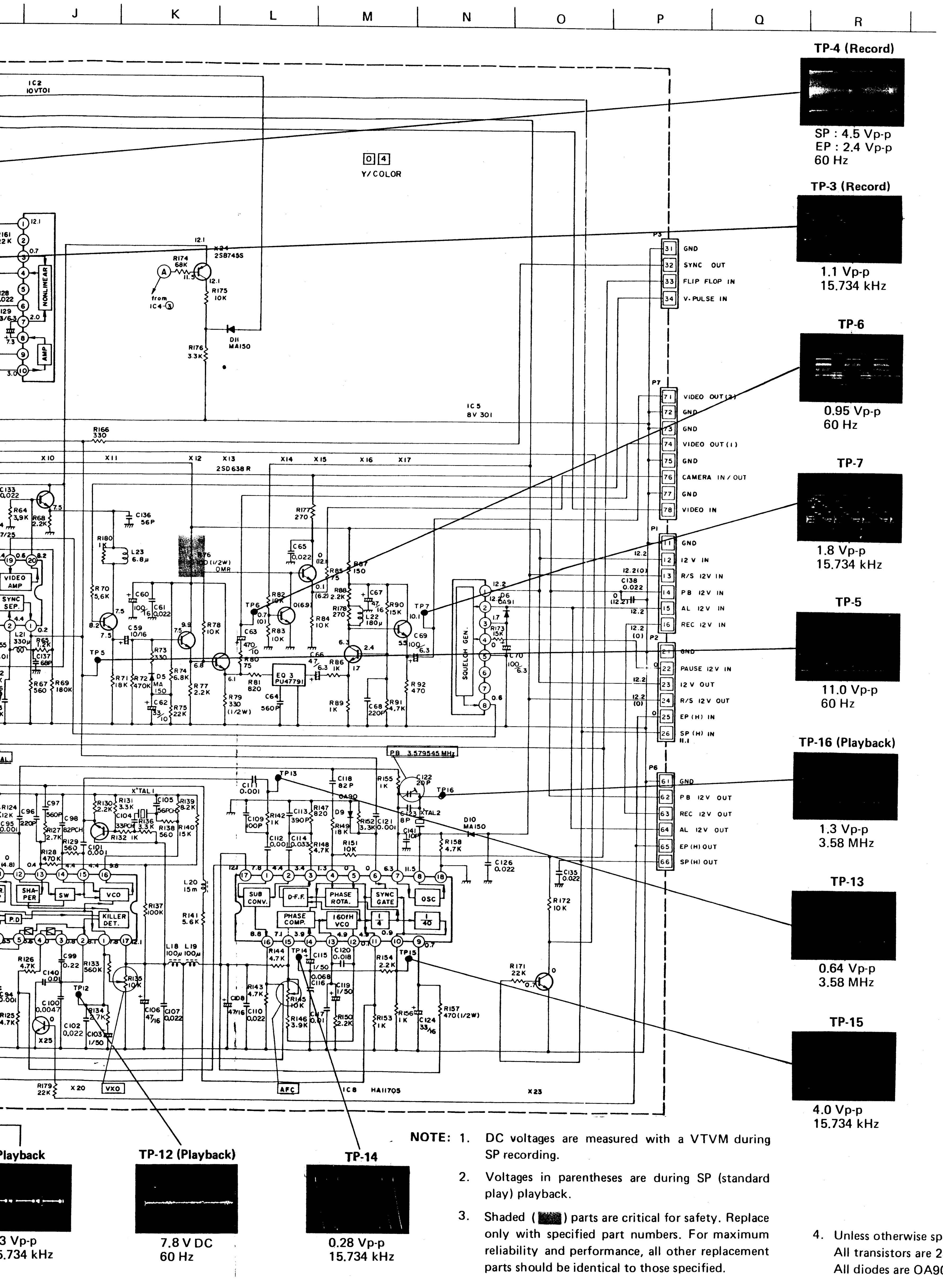
TP-8
Record : 0.30 Vp-p
Playback : 0.70 Vp-p
15.734 kHz

TP-10 (Playback)
0.65 Vp-p
15.734 kHz

TP-11 (Record)
0.58 Vp-p
15.734 kHz

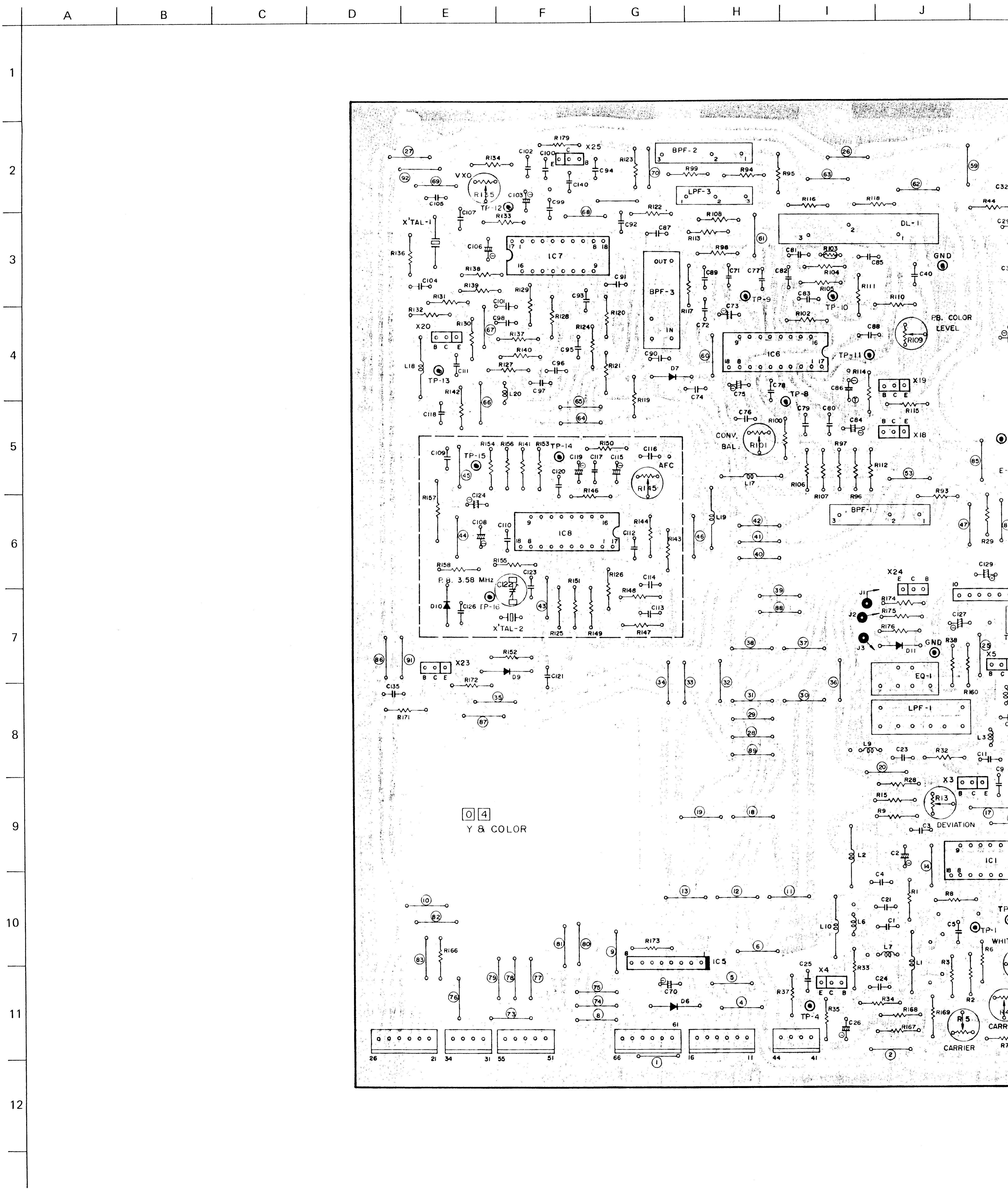
Playback
1.3 Vp-p
15.734 kHz

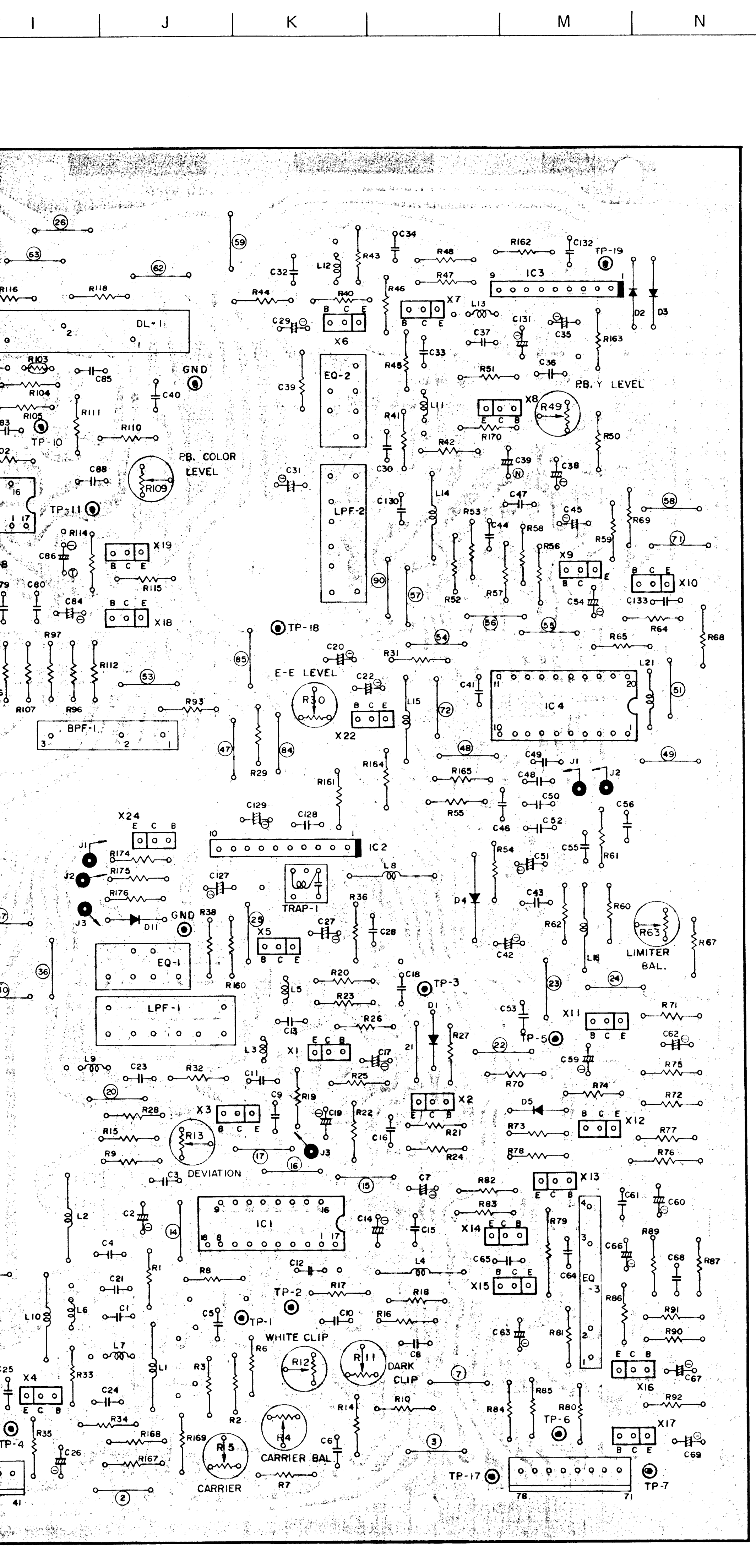
TP-12 (Playback)
7.8 V DC
60 Hz


J
K
L
M
N
O
P
Q
R
IC2 10VT01
NONLINEAR
AMP
VIDEO AMP
SYNC SEP.
IC5 8V 301
2SD638R
2SB745S
from IC4-③
Y/COLOR
SQUELCH GEN.
EQ 3 PU47791
SUB CONV.
D-F.F.
PHASE ROTA.
SYNC GATE
OSC
PHASE COMP.
160fH VCO
SHA-PER
SW
VCO
KILLER DET.
P.D
IC8 HA11705
VXO
AFC
X'TAL 1
X'TAL 2
PB 3.579545 MHz
P3
31 GND
32 SYNC OUT
33 FLIP FLOP IN
34 V-PULSE IN
P7
71 VIDEO OUT (2)
72 GND
73 GND
74 VIDEO OUT (1)
75 GND
76 CAMERA IN/OUT
77 GND
78 VIDEO IN
P1
11 GND
12 12 V IN
13 R/S 12V IN
14 PB 12V IN
15 AL 12V IN
16 REC 12V IN
P2
21 GND
22 PAUSE 12V IN
23 12 V OUT
24 R/S 12V OUT
25 EP (H) IN
26 SP (H) IN
P6
61 GND
62 PB 12V OUT
63 REC 12V OUT
64 AL 12V OUT
65 EP (H) OUT
66 SP (H) OUT
TP-4 (Record)
SP : 4.5 Vp-p
EP : 2.4 Vp-p
60 Hz
TP-3 (Record)
1.1 Vp-p
15.734 kHz
TP-6
0.95 Vp-p
60 Hz
TP-7
1.8 Vp-p
15.734 kHz
TP-5
11.0 Vp-p
60 Hz
TP-16 (Playback)
1.3 Vp-p
3.58 MHz
TP-13
0.64 Vp-p
3.58 MHz
TP-15
4.0 Vp-p
15.734 kHz
Playback
3 Vp-p
5.734 kHz
TP-12 (Playback)
7.8 V DC
60 Hz
TP-14
0.28 Vp-p
15.734 kHz

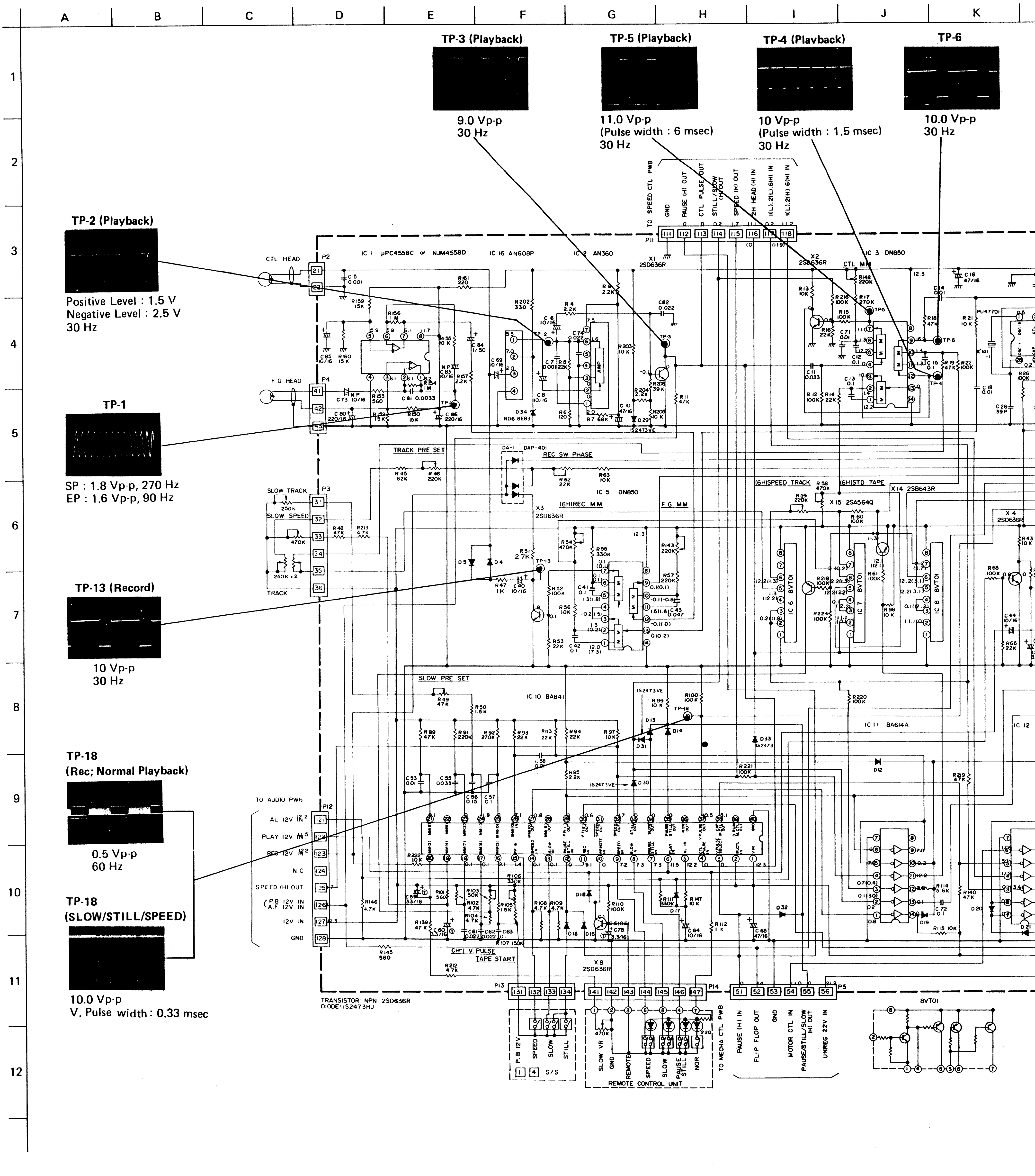
NOTE:
1. DC voltages are measured with a VTVM during SP recording.
2. Voltages in parentheses are during SP (standard play) playback.
3. Shaded (▨) parts are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.
4. Unless otherwise specified; All transistors are 2SC2647C All diodes are OA90.

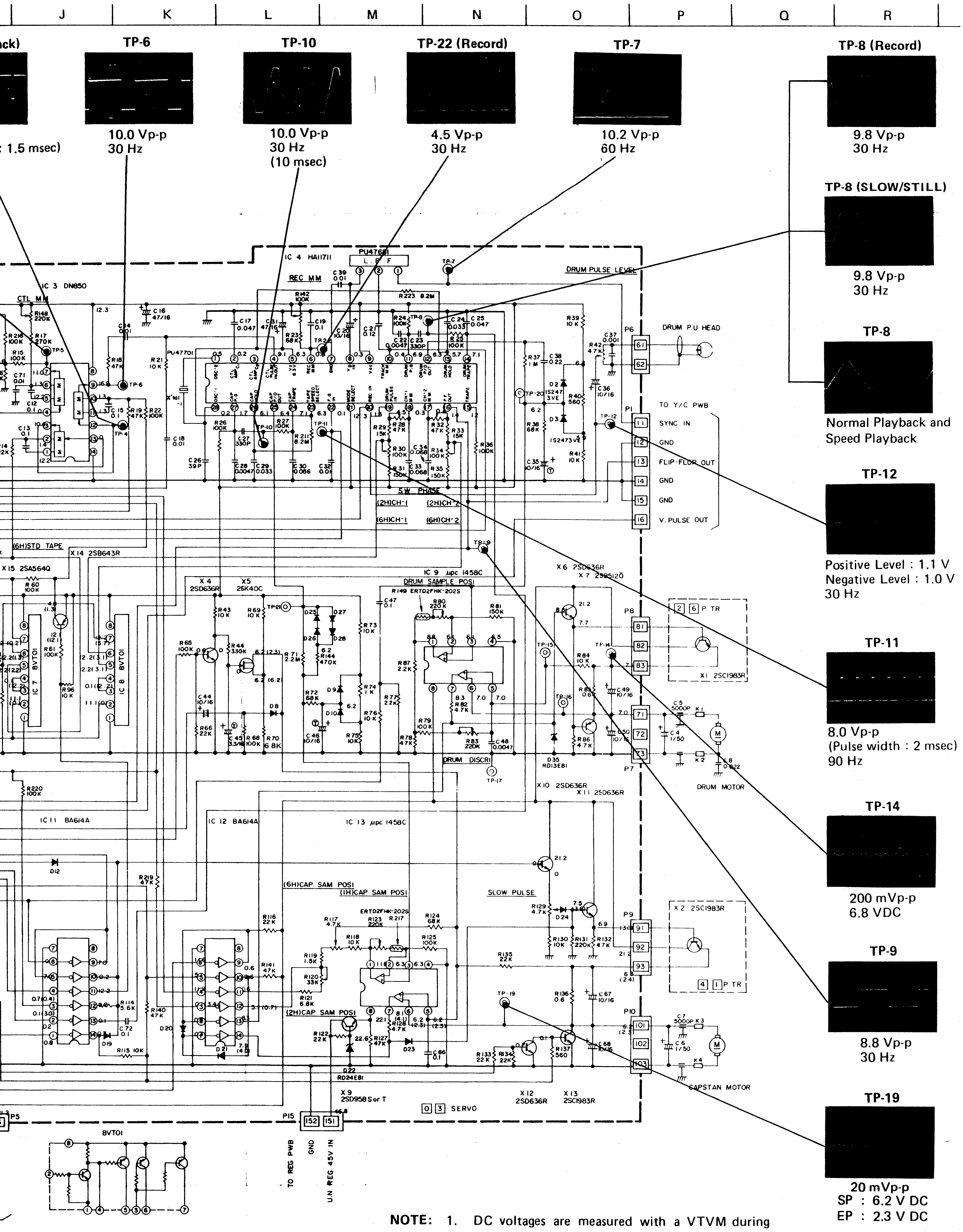
8.13 LUMINANCE AND CHROMINANCE (Y/C) CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
1
2
3
4
5
6
7
8
9
10
11
12
0 4
Y & COLOR
IC1
IC5
IC6
IC7
IC8
BPF-1
BPF-2
BPF-3
LPF-1
LPF-3
EQ-1
DL-1
VXO
X'TAL-1
X'TAL-2
P.B. 3.58 MHz
AFC
CONV. BAL.
P.B. COLOR LEVEL
DEVIATION
CARRIER
GND
TP-4
TP-8
TP-9
TP-10
TP-11
TP-12
TP-13
TP-14
TP-15
TP-16
X3
X4
X5
X18
X19
X20
X23
X24
X25
J1
J2
J3
R101
R109
R125
R145
R13
R5
IN
OUT


I
J
K
M
N
O
P
Q
R
DL-1
GND
P.B. COLOR LEVEL
R109
TP-10
TP-11
P.B. Y LEVEL
R49
IC3
TP-19
D2
D3
EQ-2
LPF-2
X6
X7
X8
X9
X10
X18
X19
TP-18
E-E LEVEL
R30
X22
IC4
BPF-1
J1
J2
J3
IC2
X24
TRAP-1
D11
D4
GND
EQ-1
LPF-1
X5
TP-3
D1
R63
LIMITER BAL.
X11
TP-5
X1
X2
D5
X12
X3
R13
DEVIATION
IC1
X13
EQ -3
X14
X15
TP-2
TP-1
WHITE CLIP
R12
R11
DARK CLIP
X16
X4
TP-4
R5
CARRIER
R4
CARRIER BAL
TP-6
TP-17
TP-7
X17
78
71

8.14 SERVO CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
9
10
11
12
TP-3 (Playback)
9.0 Vp-p
30 Hz
TP-5 (Playback)
11.0 Vp-p
(Pulse width : 6 msec)
30 Hz
TP-4 (Playback)
10 Vp-p
(Pulse width : 1.5 msec)
30 Hz
TP-6
10.0 Vp-p
30 Hz
TP-2 (Playback)
Positive Level : 1.5 V
Negative Level : 2.5 V
30 Hz
TP-1
SP : 1.8 Vp-p, 270 Hz
EP : 1.6 Vp-p, 90 Hz
TP-13 (Record)
10 Vp-p
30 Hz
TP-18
(Rec; Normal Playback)
0.5 Vp-p
60 Hz
TP-18
(SLOW/STILL/SPEED)
10.0 Vp-p
V. Pulse width: 0.33 msec
TO SPEED CTL PWB
GND
PAUSE (H) OUT
CTL PULSE OUT
STILL/SLOW (H) OUT
SPEED (H) OUT
2H HEAD (H) IN
I(L).2(L).6(H) IN
I(L).2(H).6(H) IN
P11
CTL HEAD
F.G HEAD
P2
P4
IC 1 μPC4558C or NJM4558D
IC 16 AN608P
IC 2 AN360
IC 3 DN850
CTL MM
X1 2SD636R
X2 2SD636R
TRACK PRE SET
DA-1 DAP-401
REC SW PHASE
IC 5 DN850
(6H)REC MM
F.G MM
X3 2SD636R
(6H)SPEED TRACK
(6H)STD TAPE
X14 2SB643R
X15 2SA564Q
X4 2SD636R
IC 6 8VT01
IC 7 8VT01
IC 8 8VT01
SLOW TRACK
SLOW SPEED
TRACK
P3
SLOW PRE SET
IC 10 BA841
IC 11 BA614A
IC 12
TO AUDIO PWB
AL 12V IN
PLAY 12V IN
REC 12V IN
N C
SPEED (H) OUT
(P.B 12V IN
(A.F 12V IN
12V IN
GND
P12
CH-1 V PULSE
TAPE START
X8 2SD636R
TRANSISTOR: NPN 2SD636R
DIODE: 1S2473HJ
P13
P14
P5
P.B 12V
SPEED
SLOW
STILL
S/S
SLOW VR
GND
REMOTE
SPEED
SLOW
PAUSE STILL
NOR
REMOTE CONTROL UNIT
TO MECHA CTL PWB
PAUSE (H) IN
FLIP FLOP OUT
GND
MOTOR CTL IN
PAUSE/STILL/SLOW (H) OUT
UNREG 22V IN
8VT01

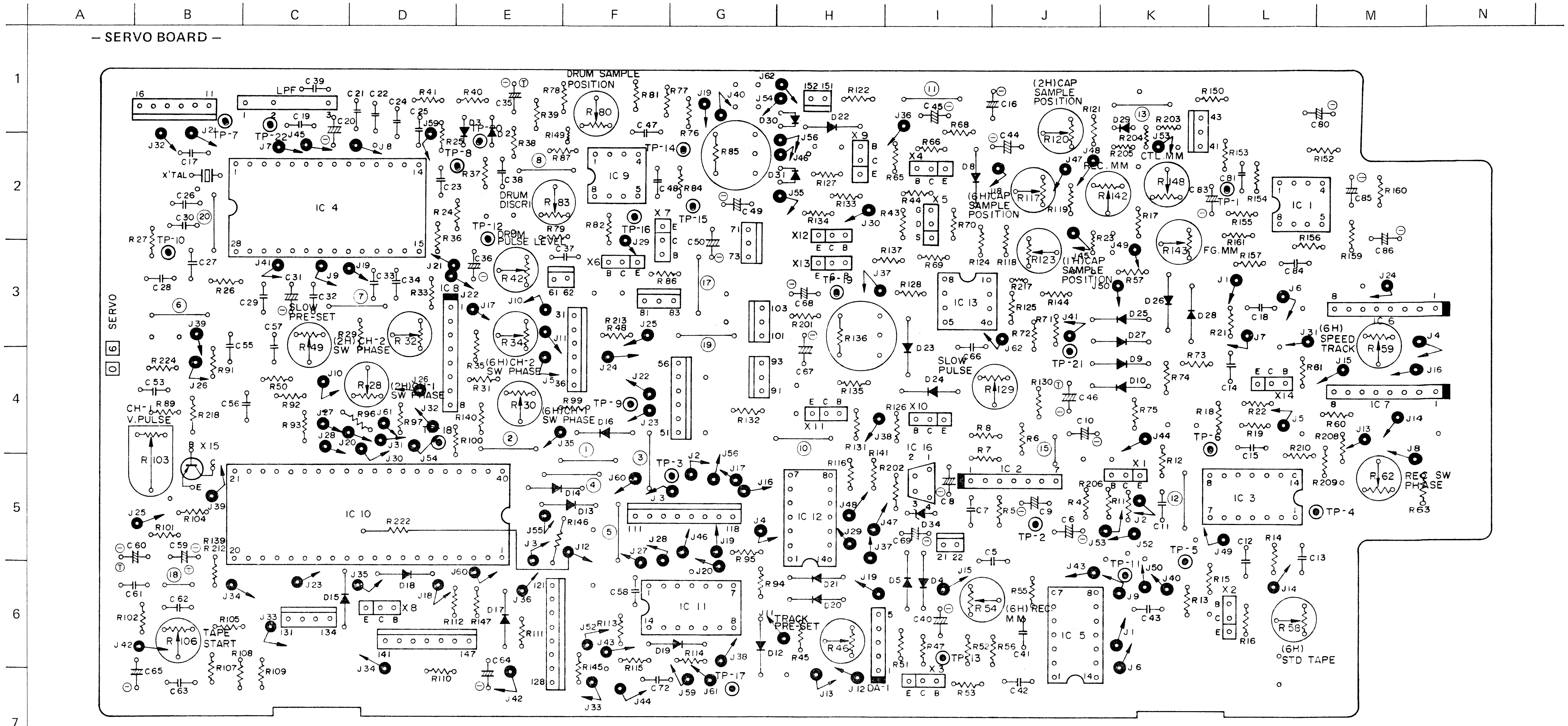

J
K
L
M
N
O
P
Q
R
ck)
: 1.5 msec)
TP-6
10.0 Vp-p
30 Hz
TP-10
10.0 Vp-p
30 Hz
(10 msec)
TP-22 (Record)
4.5 Vp-p
30 Hz
TP-7
10.2 Vp-p
60 Hz
TP-8 (Record)
9.8 Vp-p
30 Hz
TP-8 (SLOW/STILL)
9.8 Vp-p
30 Hz
TP-8
Normal Playback and
Speed Playback
TP-12
Positive Level : 1.1 V
Negative Level : 1.0 V
30 Hz
TP-11
8.0 Vp-p
(Pulse width : 2 msec)
90 Hz
TP-14
200 mVp-p
6.8 VDC
TP-9
8.8 Vp-p
30 Hz
TP-19
20 mVp-p
SP : 6.2 V DC
EP : 2.3 V DC
IC 3 DN850
CTL MM
IC 4 HA11711
PU47681
L P F
REC MM
DRUM PULSE LEVEL
PU47701
DRUM P.U HEAD
P6
P1
TO Y/C PWB
SYNC IN
GND
FLIP-FLOP OUT
GND
GND
V. PULSE OUT
SW PHASE
(2H)CH-1
(2H)CH-2
(6H)CH-1
(6H)CH-2
(6H)STD TAPE
X 14 2SB643R
X 15 2SA564Q
IC 7 8VT01
IC 8 8VT01
X 4 2SD636R
X5 2SK40C
IC 9 μpc 1458C
DRUM SAMPLE POSI
R149 ERT02FHK-202S
DRUM DISCRI
X 6 2SD636R
X 7 2SB512O
P8
2 6 P.TR
X1 2SC1983R
P7
DRUM MOTOR
X10 2SD636R
X 11 2SD636R
IC 11 BA614A
IC 12 BA614A
IC 13 μpc 1458C
(6H)CAP SAM POSI
(1H)CAP SAM POSI
(2H)CAP SAM POSI
ERT02FHK-202S
SLOW PULSE
P9
X 2 2SC1983R
4 1 P.TR
P10
CAPSTAN MOTOR
X 9 2SD958S or T
X 12 2SD636R
X 13 2SC1983R
0 3 SERVO
P15
TO REG PWB
GND
U.N REG 45V IN
8VT01
P5

NOTE: 1. DC voltages are measured with a VTVM during SP recording.

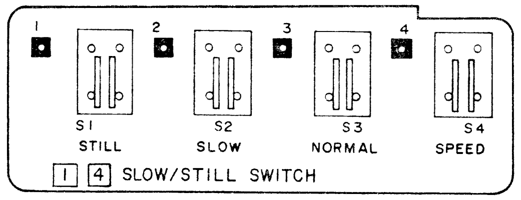
2. Voltages in parentheses are during EP recording.

8.15 SERVO CIRCUIT BOARD, SLOW/STILL SWITCH BOARD AND POWER TRANSISTOR BOARDS

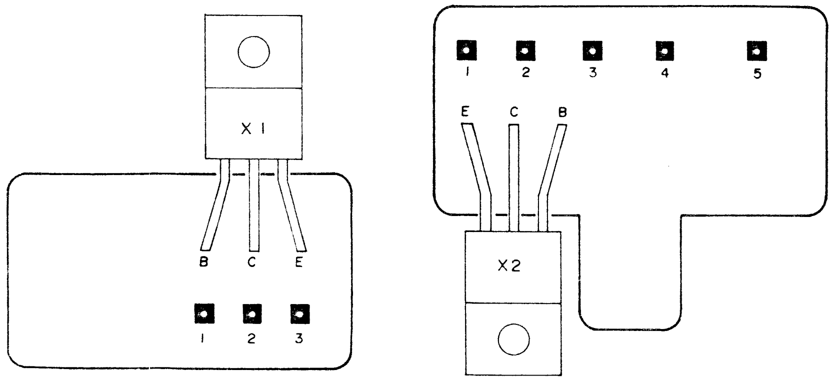
– SERVO BOARD –


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
SERVO
LPF
X'TAL
IC 4
IC 10
IC 9
IC 8
IC 11
IC 12
IC 13
IC 16
IC 2
IC 1
IC 3
IC 5
IC 6
IC 7
DRUM SAMPLE POSITION
DRUM DISCRI
DRUM PULSE LEVEL
SLOW PRE-SET
(2H) CH-2 SW PHASE
(6H) CH-2 SW PHASE
(2H) CH-1 SW PHASE
(6H) CH-1 SW PHASE
CH-1 V.PULSE
TAPE START
TRACK PRE-SET
SLOW PULSE
(2H) CAP SAMPLE POSITION
(6H) CAP SAMPLE POSITION
(1H) CAP SAMPLE POSITION
REC. MM
CTL.MM
FG.MM
(6H) SPEED TRACK
REC SW PHASE
(6H) REC MM
(6H) STD TAPE
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
TP-8
TP-9
TP-10
TP-11
TP-12
TP-13
TP-14
TP-15
TP-16
TP-17
TP-18
TP-21
TP-22
DA-1
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14
X15

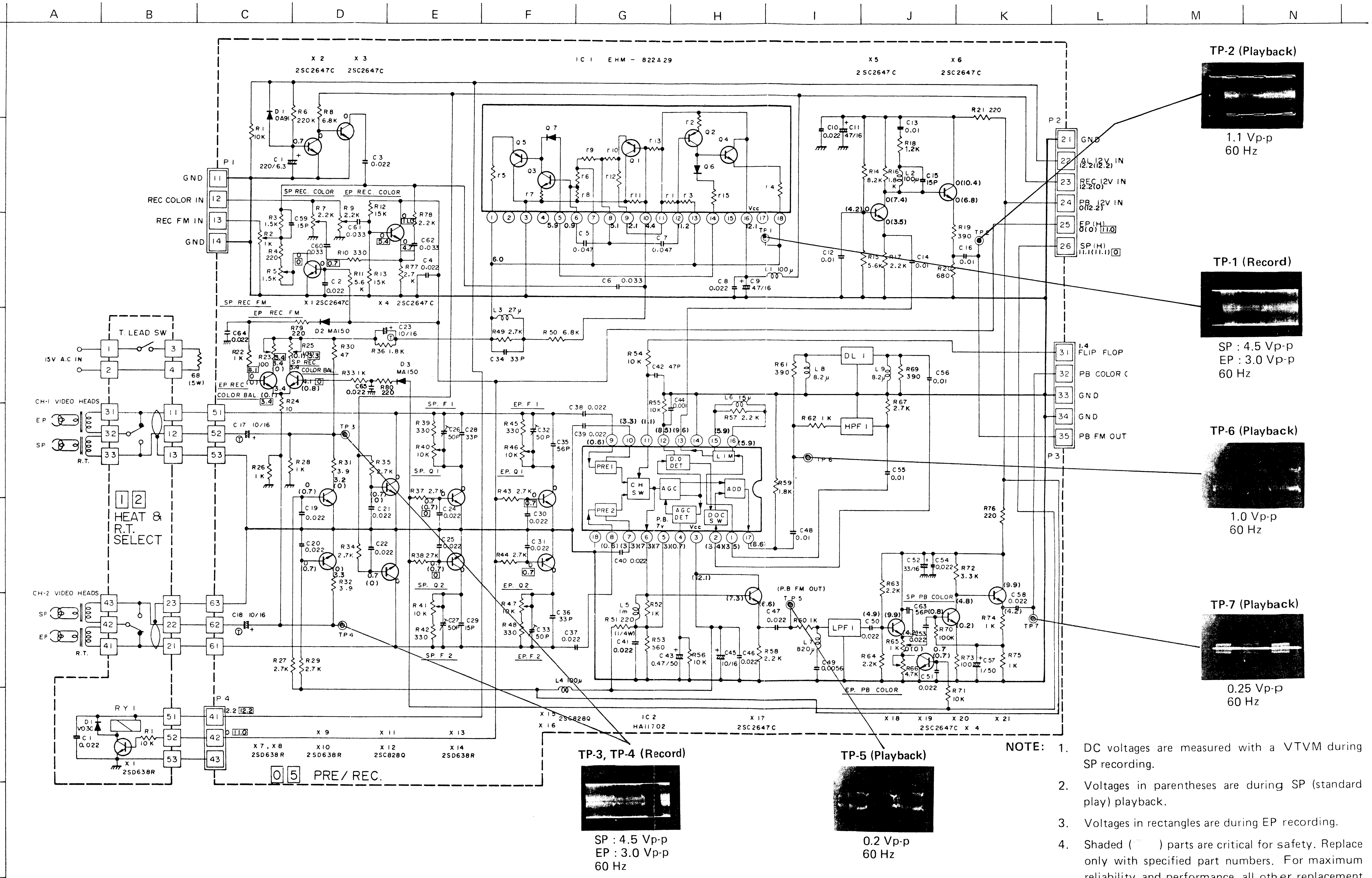
– SLOW/STILL SWITCH BOARD –


1
2
3
4
S1
STILL
S2
SLOW
S3
NORMAL
S4
SPEED
1 4 SLOW/STILL SWITCH

– POWER TRANSISTOR BOARDS –


X1
B
C
E
1
2
3
1
2
3
4
5
E
C
B
X2

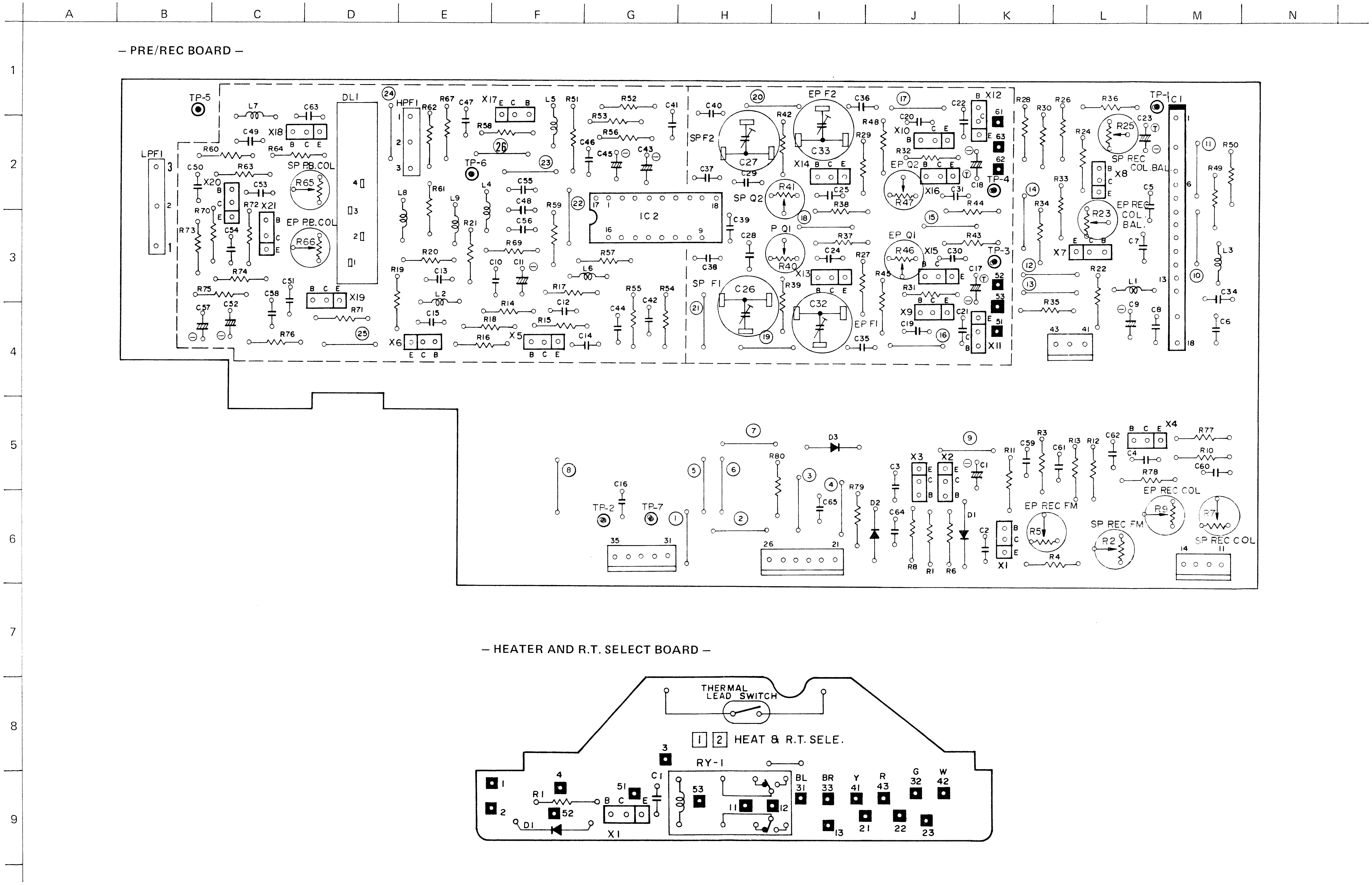
8.16 PRE AND RECORD (PRE/REC) CIRCUIT SCHEMATIC DIAGRAM, HEATER & R.T. SELECT CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
X 2 2SC2647C
X 3 2SC2647C
IC 1 EHM - 822A29
X 5 2SC2647C
X 6 2SC2647C
P 1
GND 11
REC COLOR IN 12
REC FM IN 13
GND 14
P 2
21 GND
22 AL 12V IN
23 REC 12V IN
24 PB 12V IN
25 EP (H)
26 SP (H)
31 FLIP FLOP
32 PB COLOR
33 GND
34 GND
35 PB FM OUT
P 3
SP REC COLOR
EP REC COLOR
SP REC FM
EP REC FM
COLOR BAL
T. LEAD SW
15V A.C IN
CH-1 VIDEO HEADS
CH-2 VIDEO HEADS
EP
SP
R.T.
1 2 HEAT & R.T. SELECT
RY 1
X 1 2SD638R
P 4
X 7, X 8 2SD638R
X 9
X 10 2SD638R
X 11
X 12 2SC828Q
X 13
X 14 2SD638R
X 15 2SC828Q
X 16
IC 2 HA11702
X 17 2SC2647C
X 18
X 19
X 20
X 21
2SC2647C X 4
0 5 PRE/ REC.
SP. F 1
SP. Q 1
SP. Q 2
SP. F 2
EP. F 1
EP. Q 1
EP. Q 2
EP. F 2
PRE 1
PRE 2
CH SW
AGC
D.O DET
AGC DET
DOC SW
LIM
ADD
DL 1
HPF 1
LPF 1
SP PB COLOR
EP. PB COLOR
(P.B FM OUT)
TP 1
TP 2
TP 3
TP 4
TP 5
TP 6
TP 7
TP-2 (Playback)
1.1 Vp-p
60 Hz
TP-1 (Record)
SP : 4.5 Vp-p
EP : 3.0 Vp-p
60 Hz
TP-6 (Playback)
1.0 Vp-p
60 Hz
TP-7 (Playback)
0.25 Vp-p
60 Hz
TP-3, TP-4 (Record)
SP : 4.5 Vp-p
EP : 3.0 Vp-p
60 Hz
TP-5 (Playback)
0.2 Vp-p
60 Hz

NOTE:

1. DC voltages are measured with a VTVM during SP recording.
2. Voltages in parentheses are during SP (standard play) playback.
3. Voltages in rectangles are during EP recording.
4. Shaded ( ) parts are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.17 PRE AND RECORD CIRCUIT BOARD, HEATER AND R.T. SELECT BOARD

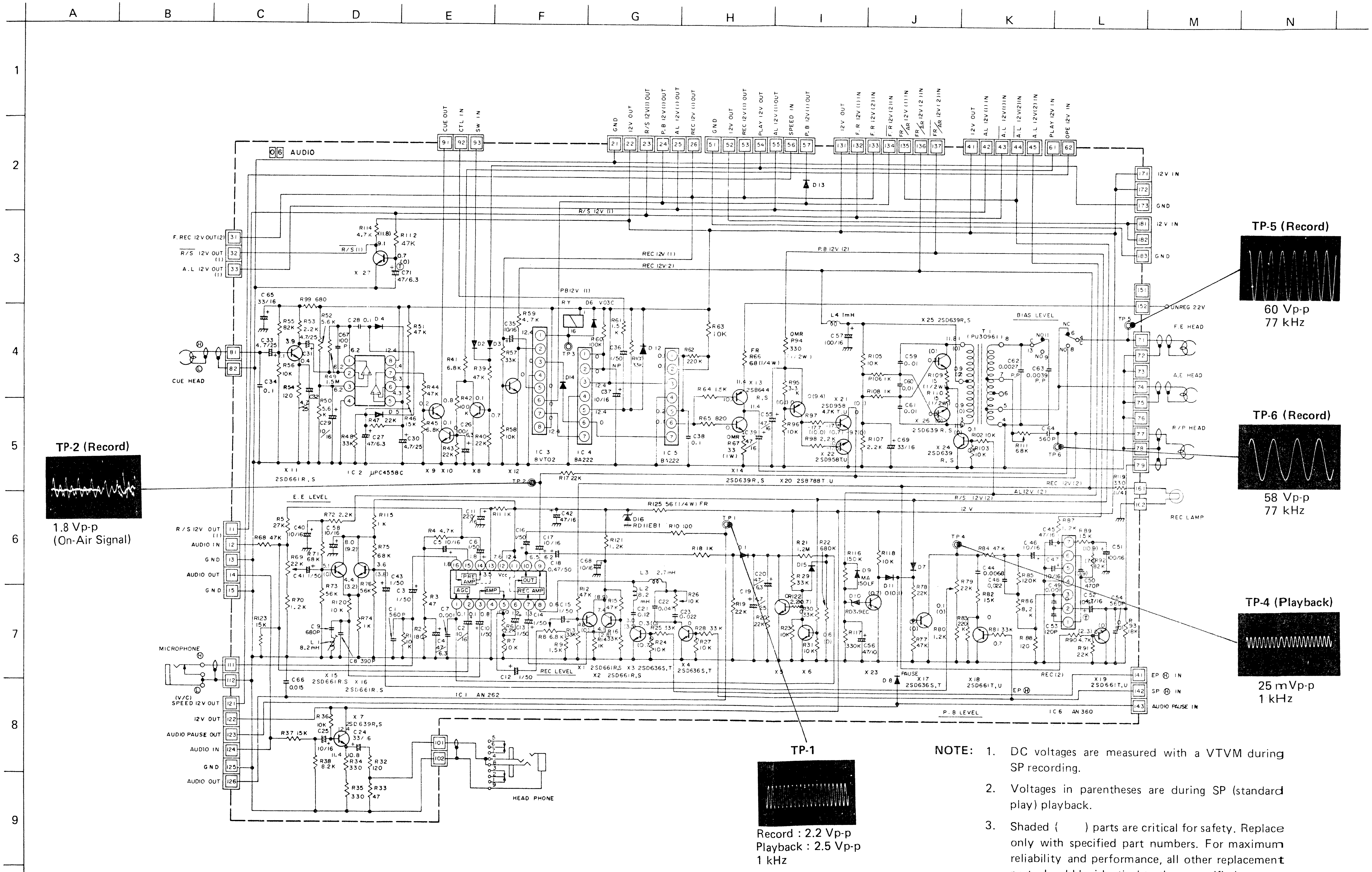


– PRE/REC BOARD –

– HEATER AND R.T. SELECT BOARD –

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
TP-5
L7
C63
DL1
HPF1
R62
R67
C47
X17
L5
R51
R52
C41
C40
EP F2
C36
C22
X12
R28
R30
R26
R36
TP-1
C1
LPF1
C49
X18
R60
R64
C50
X20
R63
SP PB.COL
R65
C53
R70
R72
X21
EP PB.COL
R66
R73
C54
R74
R75
C51
C58
C57
C52
X19
R71
R76
R58
TP-6
L8
R61
L9
L4
R21
C55
C48
C56
R20
R69
C13
R19
L2
C15
X6
C10
C11
R14
R18
R16
X5
R17
C12
R15
C14
L6
R57
R59
R53
R56
C46
C45
C43
IC2
C44
C42
R55
R54
SP F2
C37
C29
C27
R42
C33
R48
R29
X10
C20
R32
X14
SP Q2
R41
C25
R38
C39
C28
P Q1
R37
C24
R40
R39
X13
SP F1
C26
C32
EP F1
C35
R27
EP Q2
X16
C31
C18
R47
R44
TP-4
EP Q1
R43
R46
X15
C30
TP-3
R45
C17
R31
X9
C21
C19
X11
R35
R34
R33
R24
R25
C23
SP REC COL.BAL
X8
C5
R23
EP REC COL. BAL.
X7
C7
R22
L1
C9
C8
R50
R49
L3
C34
C6
D3
R80
C16
TP-2
TP-7
C65
R79
D2
C3
X3
X2
C64
R8
R1
R6
D1
C2
X1
R11
C59
R3
C61
R13
R12
C62
X4
R77
R10
C60
C4
R78
EP REC COL
EP REC FM
R9
R7
SP REC FM
R5
R2
R4
SP REC COL
THERMAL LEAD SWITCH
1 2 HEAT & R.T. SELE.
RY-1
BL
BR
Y
R
G
W
R1
D1
X1
B C E

8.18 AUDIO CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
06 AUDIO
CUE OUT
CTL IN
SW IN
GND
12V OUT
R/S 12V(1)OUT
P.B 12V(1)OUT
A.L 12V(1)OUT
REC 12V(1)OUT
REC 12V(1)OUT
PLAY 12V OUT
SPEED IN
P.B 12V(1)OUT
F.R 12V(1)IN
F.R 12V(2)IN
A.L 12V(1)IN
PLAY 12V IN
OPE 12V IN
12V IN
GND
F.REC 12V OUT(2)
R/S 12V OUT (1)
A.L 12V OUT (1)
CUE HEAD
UNREG 22V
F.E HEAD
A.E HEAD
R/P HEAD
REC LAMP
BIAS LEVEL
E.E LEVEL
REC LEVEL
P.B LEVEL
R/S 12V OUT (1)
AUDIO IN
GND
AUDIO OUT
GND
MICROPHONE
(V/C) SPEED 12V OUT
12V OUT
AUDIO PAUSE OUT
AUDIO IN
GND
AUDIO OUT
HEAD PHONE
EP ⊕ IN
SP ⊕ IN
AUDIO PAUSE IN
IC 1 AN262
IC 2 μPC4558C
IC 3 8VT02
IC 4 BA222
IC 5 BA222
IC 6 AN360
2SD661R,S
2SD639R,S
2SD636S,T
2SB644 R,S
2SD958T,U
2SB788T U
2SD661T,U
T1 (PU30961)
L4 1mH
L3 2.7mH
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6

TP-5 (Record)
60 Vp-p
77 kHz

TP-6 (Record)
58 Vp-p
77 kHz

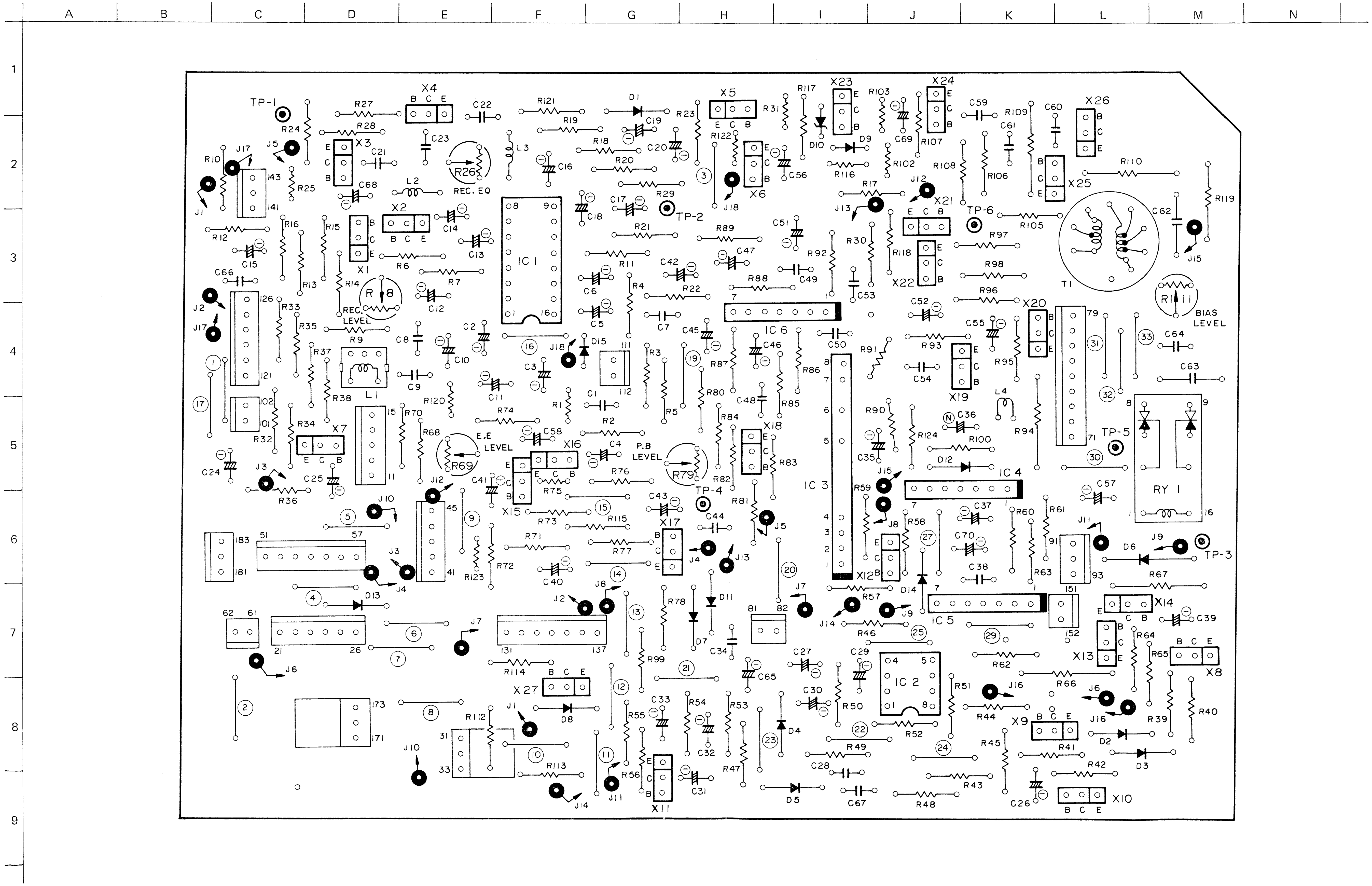
TP-2 (Record)
1.8 Vp-p
(On-Air Signal)

TP-4 (Playback)
25 mVp-p
1 kHz

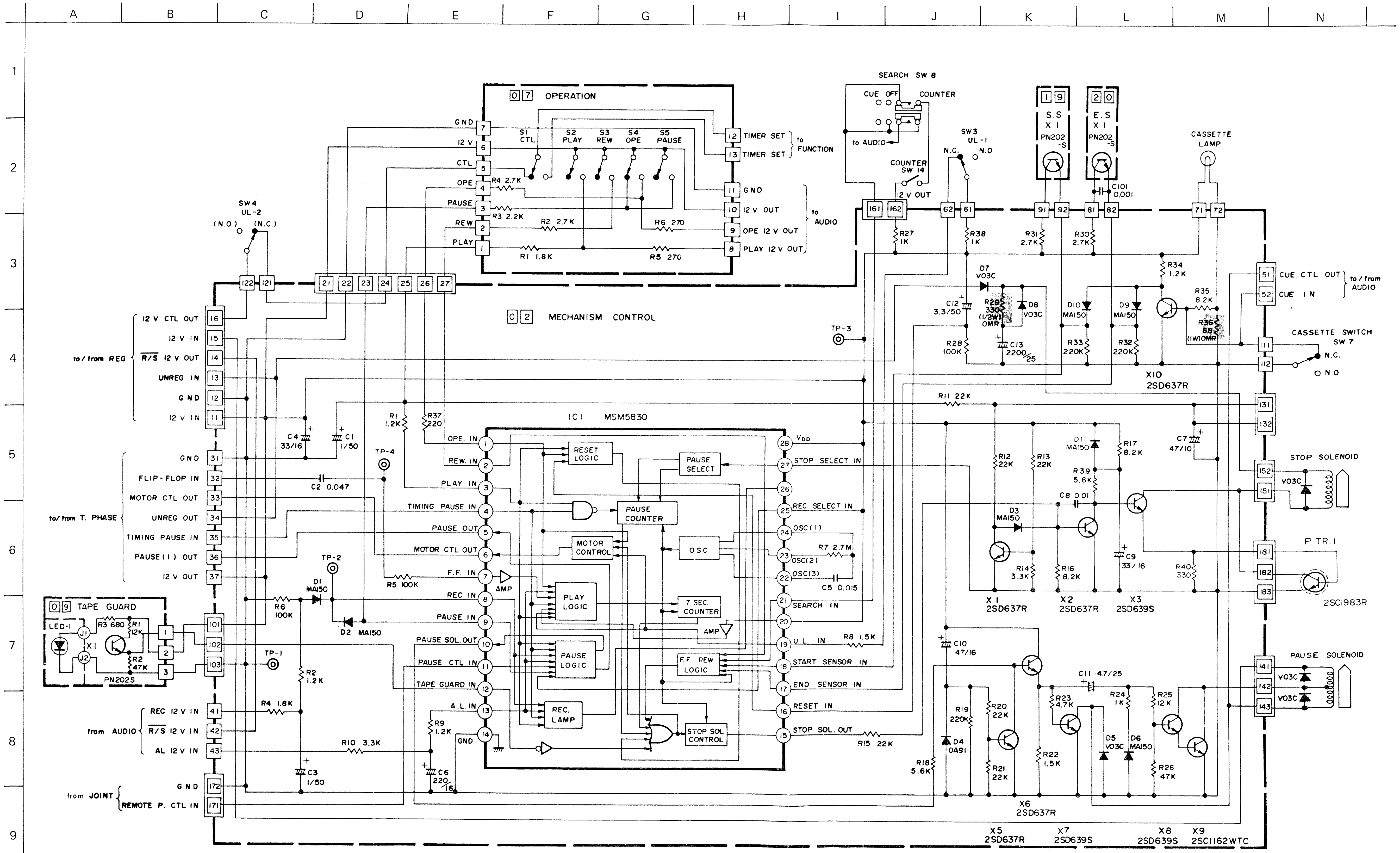
TP-1
Record : 2.2 Vp-p
Playback : 2.5 Vp-p
1 kHz

NOTE:
1. DC voltages are measured with a VTVM during SP recording.
2. Voltages in parentheses are during SP (standard play) playback.
3. Shaded ( ) parts are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.19 AUDIO CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
REC. EQ
REC. LEVEL
E.E LEVEL
P.B LEVEL
BIAS LEVEL
R26
R8
R69
R79
R111
IC 1
IC 2
IC 3
IC 4
IC 5
IC 6
RY 1
T1
L1
L2
L3
L4
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14
X15
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
B C E
E C B
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
J14
J15
J16
J17
J18
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15

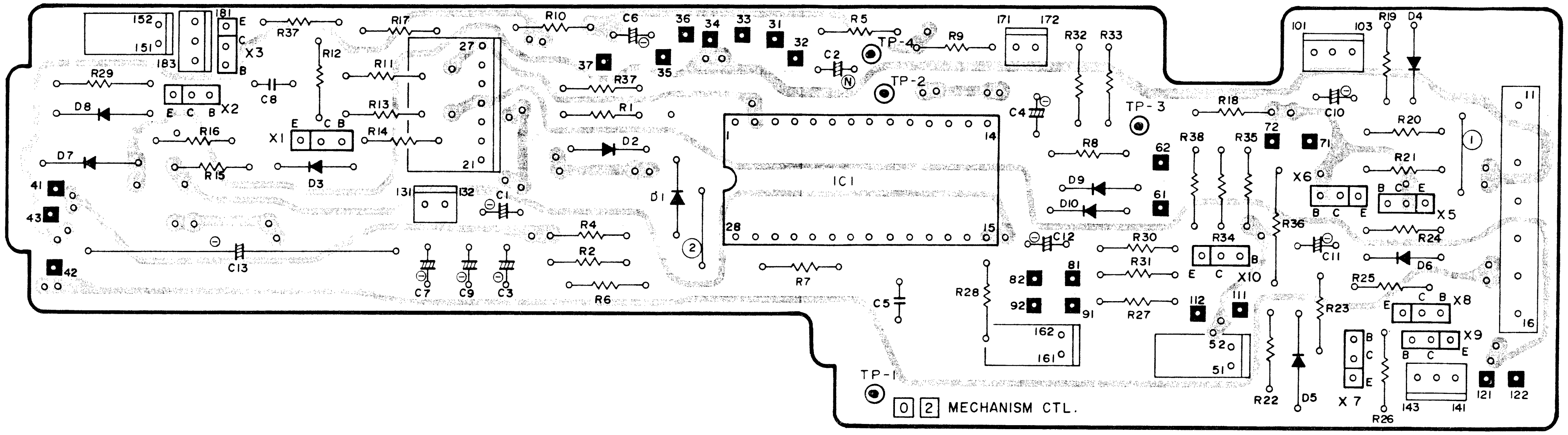
8.20 MECHANISM CONTROL, OPERATION AND TAPE GUARD CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
07 OPERATION
GND
12 V
CTL
OPE
PAUSE
REW
PLAY
S1 CTL
S2 PLAY
S3 REW
S4 OPE
S5 PAUSE
R4 2.7K
R3 2.2K
R2 2.7K
R6 270
R1 1.8K
R5 270
TIMER SET
TIMER SET
to FUNCTION
GND
12 V OUT
OPE 12 V OUT
PLAY 12 V OUT
to AUDIO
SW4 UL-2
(N.O.)
(N.C.)
02 MECHANISM CONTROL
SEARCH SW 8
CUE OFF
COUNTER
to AUDIO
COUNTER SW 14
12 V OUT
SW3 UL-1
N.C.
N.O
19
S.S X1 PN202-S
20
E.S X1 PN202-S
C101 0.001
CASSETTE LAMP
R27 1K
R38 1K
R31 2.7K
R30 2.7K
R34 1.2K
R35 8.2K
R36 68 (1W)OMR
D7 VO3C
C12 3.3/50
R29 330 (1/2W) OMR
D8 VO3C
D10 MA150
D9 MA150
R28 100K
C13 2200/25
R33 220K
R32 220K
X10 2SD637R
TP-3
CUE CTL OUT
CUE IN
to/from AUDIO
CASSETTE SWITCH SW 7
N.C.
N.O
to/from REG
12 V CTL OUT
12 V IN
R/S 12 V OUT
UNREG IN
GND
12 V IN
C4 33/16
C1 1/50
R1 1.2K
R37 220
IC1 MSM5830
R11 22K
OPE. IN
REW. IN
PLAY IN
TIMING PAUSE IN
PAUSE OUT
MOTOR CTL OUT
F.F. IN
REC IN
PAUSE IN
PAUSE SOL. OUT
PAUSE CTL IN
TAPE GUARD IN
A.L. IN
GND
VDD
STOP SELECT IN
REC SELECT IN
OSC(1)
OSC(2)
OSC(3)
SEARCH IN
U.L. IN
START SENSOR IN
END SENSOR IN
RESET IN
STOP SOL. OUT
RESET LOGIC
PAUSE SELECT
PAUSE COUNTER
MOTOR CONTROL
OSC
AMP
PLAY LOGIC
7 SEC. COUNTER
PAUSE LOGIC
F.F. REW LOGIC
REC. LAMP
STOP SOL CONTROL
R7 2.7M
C5 0.015
R8 1.5K
R15 22K
TP-4
C2 0.047
R5 100K
to/from T. PHASE
GND
FLIP-FLOP IN
MOTOR CTL OUT
UNREG OUT
TIMING PAUSE IN
PAUSE(1) OUT
12 V OUT
TP-2
D1 MA150
D2 MA150
R6 100K
09 TAPE GUARD
LED-1
R3 680
R1 12K
X1
J1
J2
R2 47K
PN202S
TP-1
R2 1.2K
R4 1.8K
R10 3.3K
C3 1/50
R9 1.2K
C6 220/16
from AUDIO
REC 12 V IN
R/S 12 V IN
AL 12 V IN
from JOINT
GND
REMOTE P. CTL IN
R12 22K
R13 22K
D11 MA150
R17 8.2K
R39 5.6K
C7 47/10
C8 0.01
D3 MA150
C9 33/16
R14 3.3K
R16 8.2K
R40 330
X1 2SD637R
X2 2SD637R
X3 2SD639S
STOP SOLENOID
VO3C
P. TR. 1
2SC1983R
C10 47/16
C11 4.7/25
R19 220K
R20 22K
D4 OA91
R21 22K
R18 5.6K
R22 1.5K
R23 4.7K
R24 1K
R25 12K
D5 VO3C
D6 MA150
R26 47K
PAUSE SOLENOID
X6 2SD637R
X5 2SD637R
X7 2SD639S
X8 2SD639S
X9 2SC1162WTC

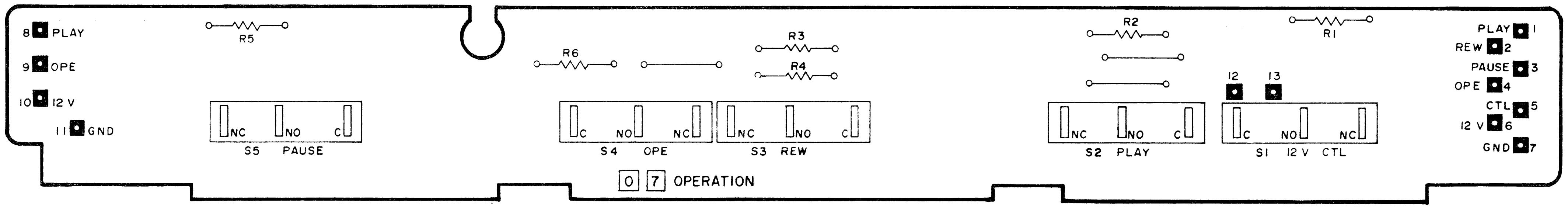
NOTE: Shaded ( ) parts are critical for safety. Replace only with specified part numbers.
For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.21 MECHANISM CONTROL CIRCUIT BOARD, OPERATION CIRCUIT BOARD, TAPE GUARD BOARD, START AND END SENSOR BOARD

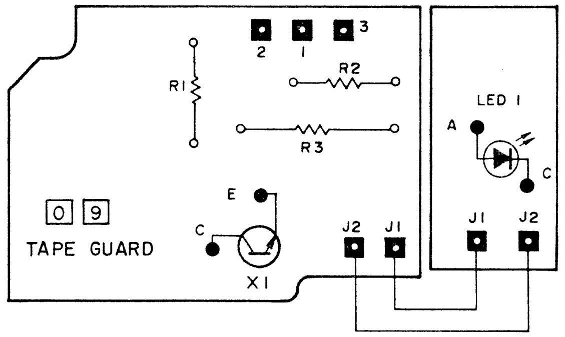
— MECHANISM CONTROL BOARD —


A B C D E F G H I J K L M N
1 2 3 4
152 151 183 181 X3 E C B
R37 R17 R12 R11 R13 R14 R10 C6 R37 R1
36 34 33 31 32 35 37
R5 C2 TP-4 TP-2 R9 171 172 R32 R33 TP-3
101 103 R19 D4 R18 C10 R20 R21 72 71 R35 R38 62 61
R29 D8 X2 E C B C8 R16 R15 D7 X1 D3 D2 D1
27 21 131 132 C1 C13 41 43 42
IC1 1 14 28 15
R4 R2 R6 C7 C9 C3 R7 C5 R28
C4 R8 D9 D10 C12 R30 R31 R27 82 81 92 91
R34 X10 E C B R36 C11 X6 B C E X5 R24 D6 R25 X8 R23 X9 X7
112 111 162 161 52 51 R22 D5 R26 143 141 121 122 11 16
TP-1
02 MECHANISM CTL.

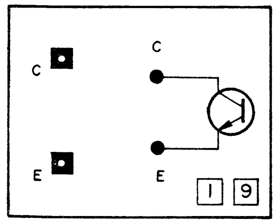
— OPERATION BOARD —


8 PLAY
9 OPE
10 12 V
11 GND
R5 R6 R3 R4 R2 R1
NC NO C
S5 PAUSE
S4 OPE
S3 REW
S2 PLAY
S1 12 V CTL
12 13
PLAY 1
REW 2
PAUSE 3
OPE 4
CTL 5
12 V 6
GND 7
07 OPERATION

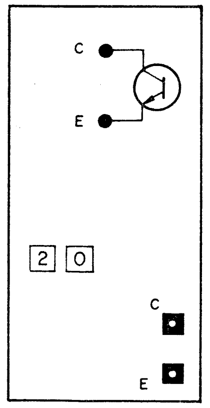
— TAPE GUARD BOARD—


2 1 3
R1 R2 R3
LED 1
A C
E C X1
J2 J1 J1 J2
09
TAPE GUARD

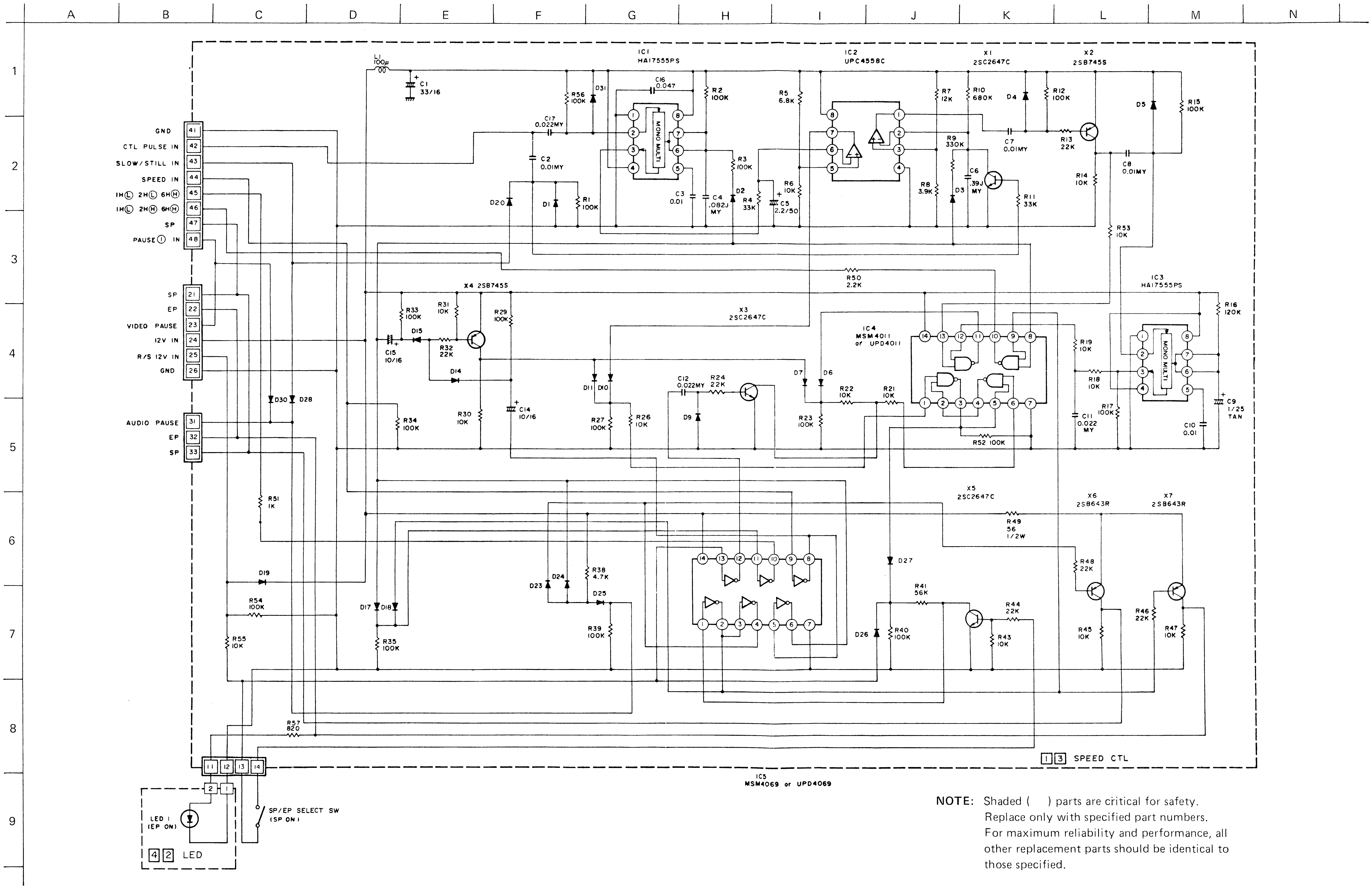
— START SENSOR BOARD —



— END SENSOR BOARD —

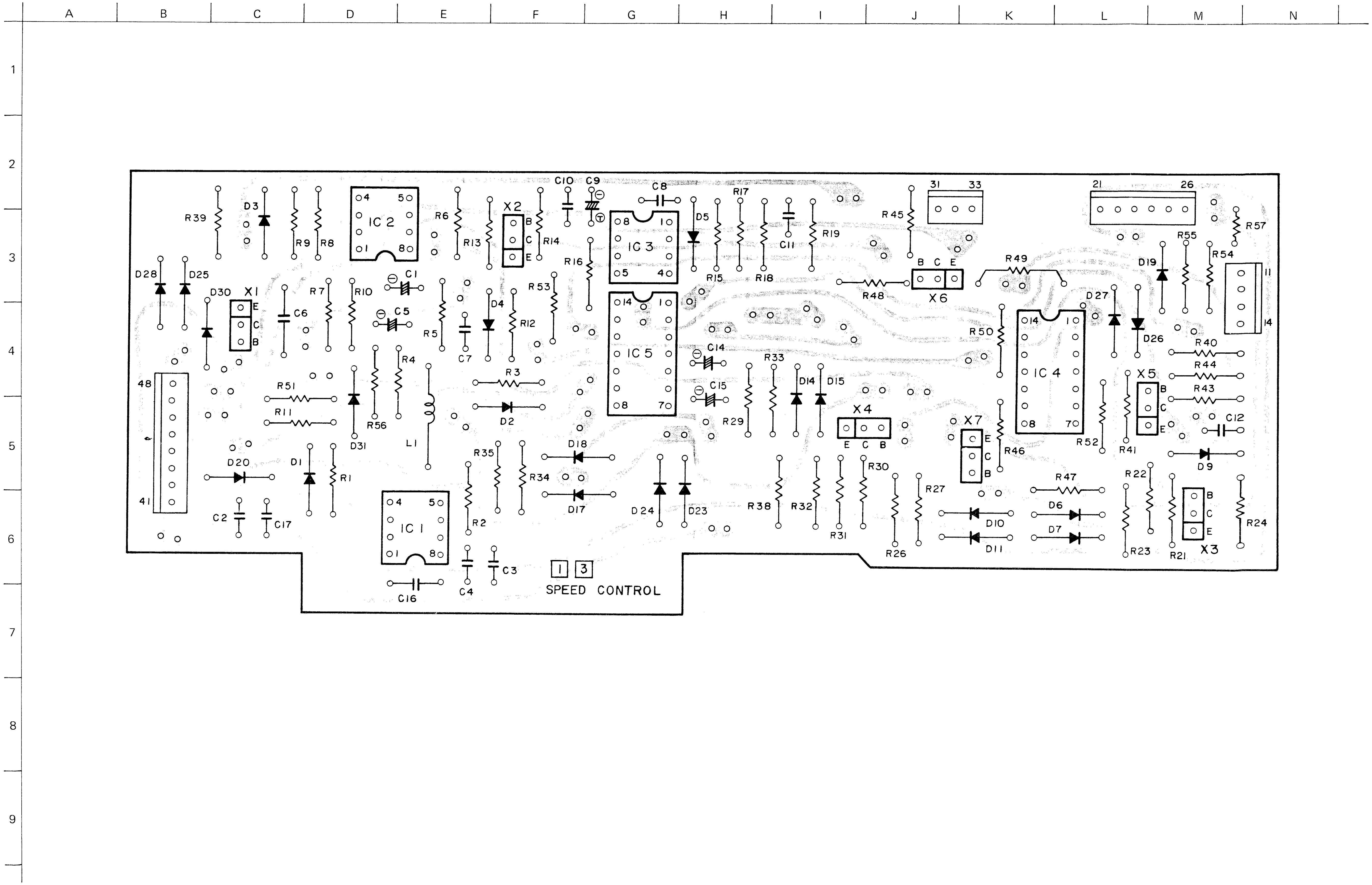


8.22 SPEED CONTROL CIRCUIT SCHEMATIC DIAGRAM

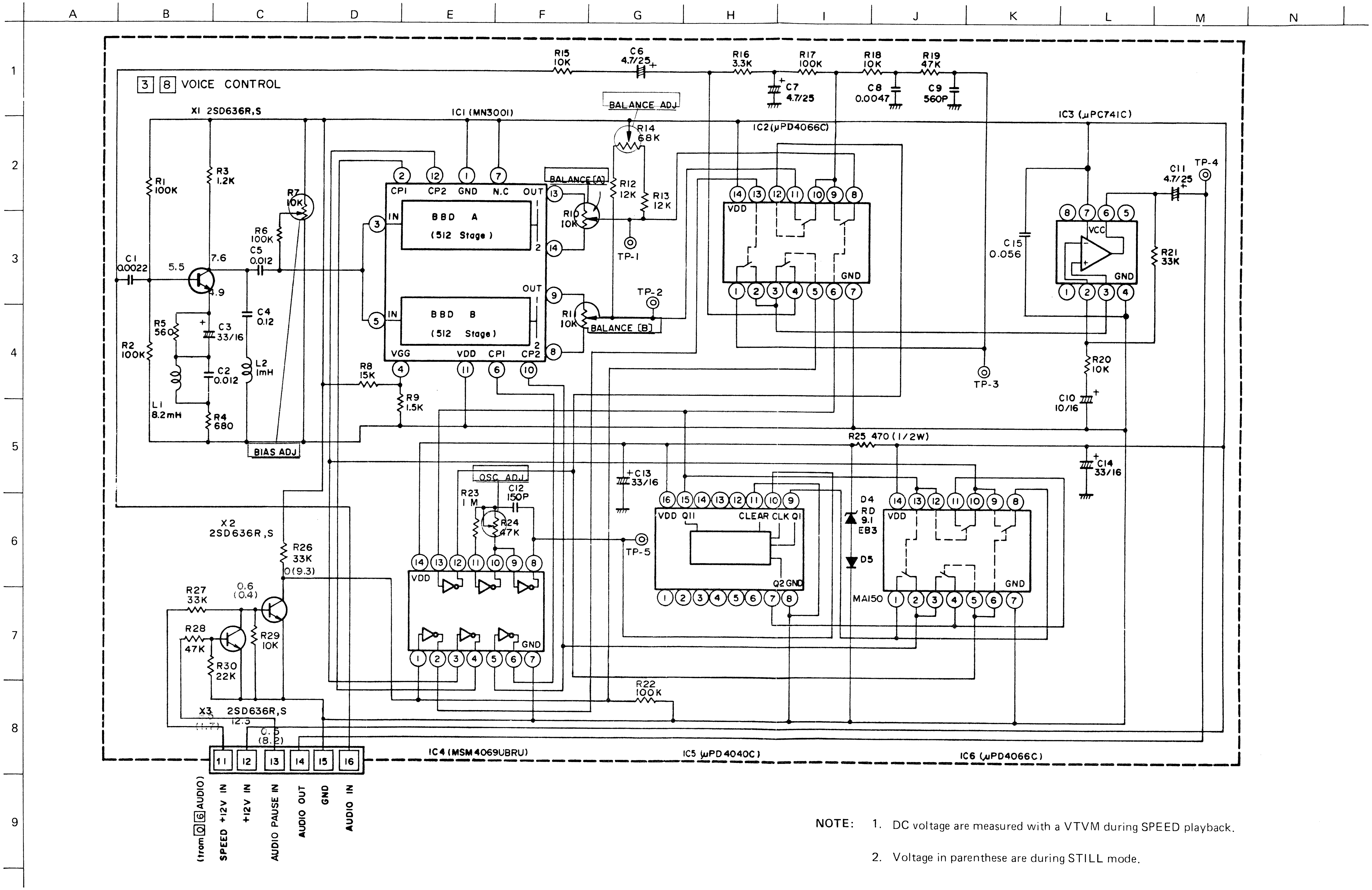

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
IC1
HA17555PS
IC2
UPC4558C
X1
2SC2647C
X2
2SB745S
L1
100μ
C1
33/16
R56
100K
D31
C16
0.047
R2
100K
R5
6.8K
R7
12K
R10
680K
D4
R12
100K
D5
R15
100K
C17
0.022MY
MONO MULTI
C2
0.01MY
R3
100K
R9
330K
C6
.39J
MY
C7
0.01MY
R13
22K
C8
0.01MY
R14
10K
R6
10K
C5
2.2/50
R8
3.9K
D3
R11
33K
D20
D1
R1
100K
C3
0.01
C4
.082J
MY
D2
R4
33K
R53
10K
GND
CTL PULSE IN
SLOW/STILL IN
SPEED IN
1H(L) 2H(L) 6H(H)
1H(L) 2H(H) 6H(H)
SP
PAUSE(I) IN
41
42
43
44
45
46
47
48
R50
2.2K
IC3
HA17555PS
SP
EP
VIDEO PAUSE
12V IN
R/S 12V IN
GND
21
22
23
24
25
26
X4 2SB745S
R33
100K
R31
10K
R29
100K
X3
2SC2647C
IC4
MSM4011
or UPD4011
R16
120K
C15
10/16
D15
R32
22K
R19
10K
D14
R18
10K
D11
D10
C12
0.022MY
R24
22K
D7
D6
R22
10K
R21
10K
C9
1/25
TAN
D30
D28
C14
10/16
R34
100K
R30
10K
R27
100K
R26
10K
D9
R23
100K
C11
0.022
MY
R17
100K
C10
0.01
AUDIO PAUSE
EP
SP
31
32
33
R52 100K
X5
2SC2647C
X6
2SB643R
X7
2SB643R
R51
1K
R49
56
1/2W
D27
R48
22K
D19
R38
4.7K
D24
D23
D25
R41
56K
R54
100K
D17
D18
R44
22K
R46
22K
R39
100K
D26
R40
100K
R43
10K
R45
10K
R47
10K
R55
10K
R35
100K
R57
820
11
12
13
14
13 SPEED CTL
IC5
MSM4069 or UPD4069
2
1
LED 1
(EP ON)
SP/EP SELECT SW
(SP ON)
42 LED

NOTE: Shaded (   ) parts are critical for safety.
Replace only with specified part numbers.
For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.23 SPEED CONTROL CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
R39
D3
R9
R8
IC 2
R6
R13
X2
R14
C10
C9
C8
IC 3
D5
R17
R15
R18
C11
R19
R45
31
33
21
26
R57
R55
R54
11
14
D28
D25
D30
X1
C6
R7
R10
C1
C5
R5
C7
D4
R12
R53
R16
IC 5
C14
C15
R33
D14
D15
R29
X6
R48
R49
R50
IC 4
D27
D26
D19
R40
R44
R43
X5
C12
D9
48
41
R51
R11
D31
R56
R4
L1
R3
D2
D18
D17
R35
R34
D24
D23
R38
R32
R31
R30
X4
X7
R46
R52
R41
R27
R26
D10
D11
R47
D6
D7
R22
R23
R21
X3
R24
D20
D1
R1
C2
C17
IC 1
R2
C4
C3
C16
1
3
SPEED CONTROL
E
C
B

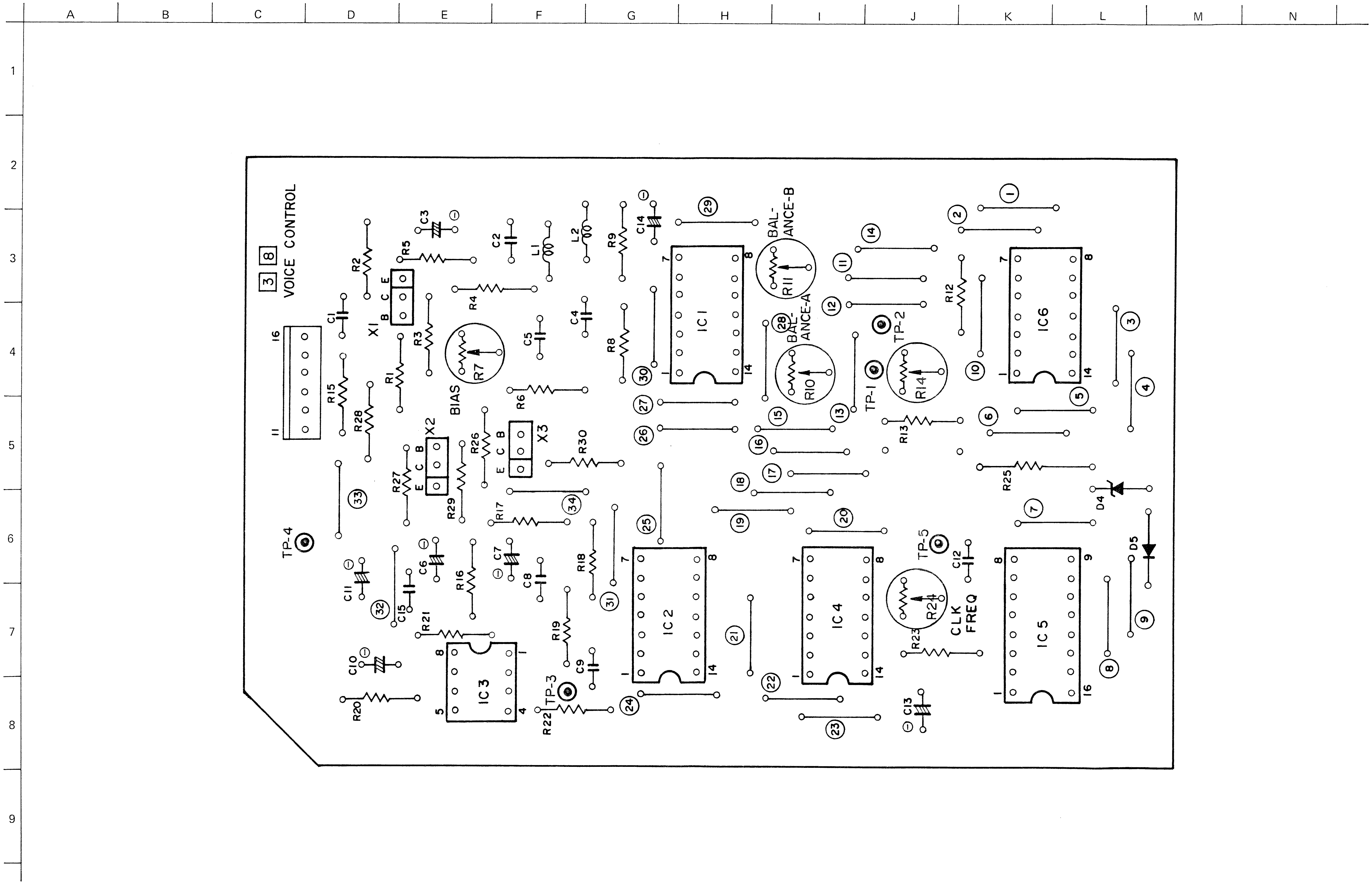
8.24 VOICE CONTROL SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
3 8 VOICE CONTROL
X1 2SD636R,S
IC1 (MN3001)
R15 10K
C6 4.7/25
R16 3.3K
R17 100K
R18 10K
R19 47K
C7 4.7/25
C8 0.0047
C9 560P
BALANCE ADJ
R14 68K
IC2(μPD4066C)
IC3 (μPC741C)
R1 100K
R3 1.2K
R7 10K
R6 100K
C5 0.012
C1 0.0022
5.5
7.6
4.9
R5 560
C3 33/16
C4 0.12
R2 100K
C2 0.012
L2 1mH
L1 8.2mH
R4 680
BIAS ADJ
CP1
CP2
GND
N.C
OUT
IN
BBD A
(512 Stage)
BBD B
(512 Stage)
VGG
VDD
CP1
CP2
BALANCE (A)
R12 12K
R13 12K
R10 10K
R11 10K
TP-1
TP-2
BALANCE (B)
R8 15K
R9 1.5K
TP-3
VDD
GND
C15 0.056
C11 4.7/25
TP-4
VCC
R21 33K
R20 10K
C10 10/16
R25 470 (1/2W)
C14 33/16
C13 33/16
OSC ADJ
R23 1 M
C12 150P
R24 47K
TP-5
VDD Q11
CLEAR CLK Q1
Q2 GND
D4 RD 9.1 EB3
D5
MA150
X2 2SD636R,S
R26 33K
0(9.3)
R27 33K
0.6 (0.4)
R28 47K
R29 10K
R30 22K
R22 100K
X3 2SD636R,S
(1.7)
12.5
0.5 (8.2)
11
12
13
14
15
16
IC4 (MSM4069UBRU)
IC5 (μPD4040C)
IC6 (μPD4066C)
(from 0 16 AUDIO)
SPEED +12V IN
+12V IN
AUDIO PAUSE IN
AUDIO OUT
GND
AUDIO IN

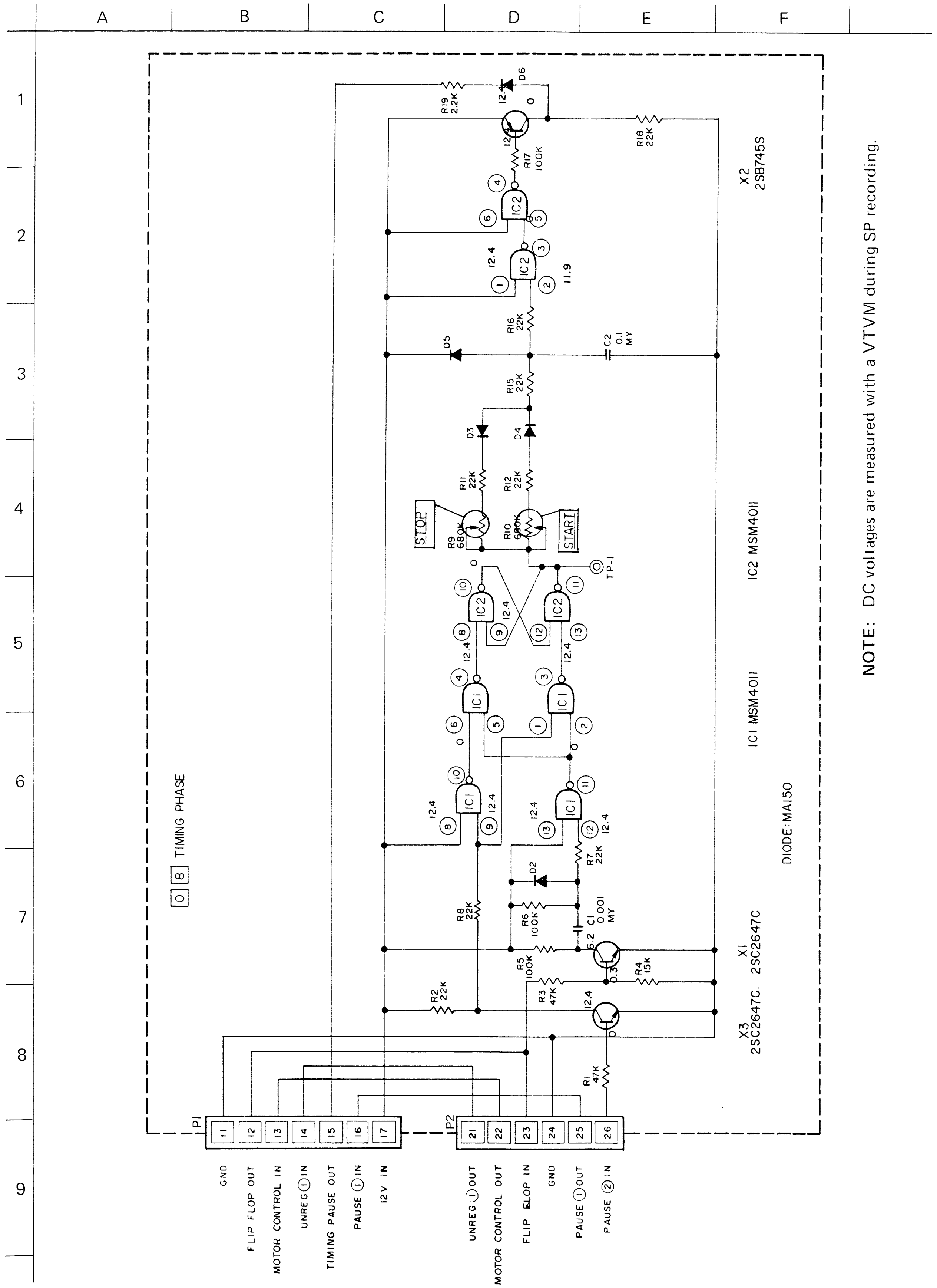
NOTE: 1. DC voltage are measured with a VTVM during SPEED playback.

2. Voltage in parenthese are during STILL mode.

8.25 VOICE CONTROL CIRCUIT BOARD

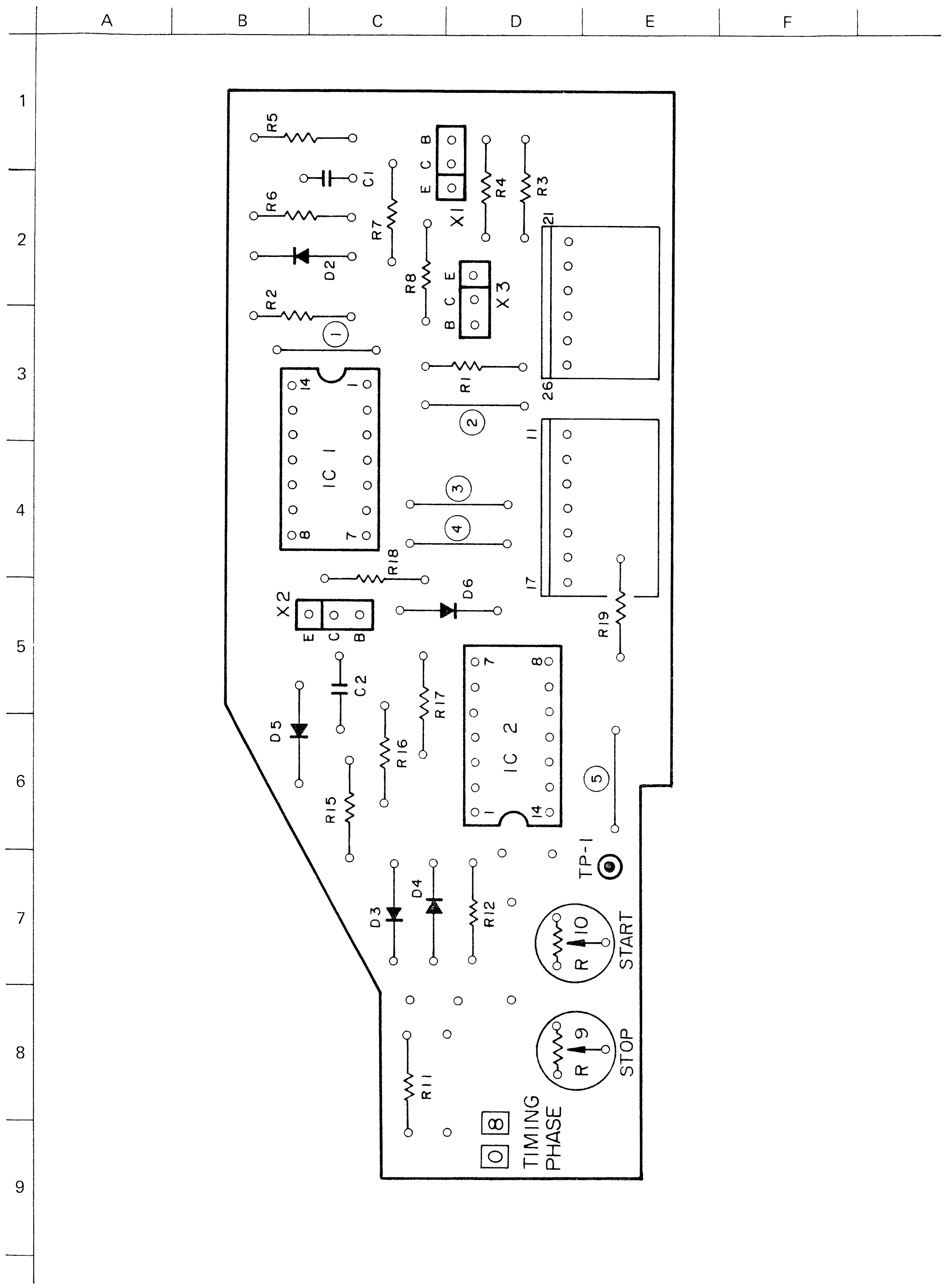

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
3 8 VOICE CONTROL
IC1
IC2
IC3
IC4
IC5
IC6
X1
X2
X3
B C E
E C B
R1
R2
R3
R4
R5
R6
R7
BIAS
R8
R9
R10
BAL-ANCE-A
R11
BAL-ANCE-B
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
CLK FREQ
R25
R26
R27
R28
R29
R30
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
L1
L2
D4
D5
TP-1
TP-2
TP-3
TP-4
TP-5
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑
㉒
㉓
㉔
㉕
㉖
㉗
㉘
㉙
㉚
㉛
㉜
㉝
㉞
1
7
8
14
16
11
4
5
9

8.26 TIMING PHASE CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
1
2
3
4
5
6
7
8
9
D6
R19 2.2K
R18 22K
R17 100K
X2 2SB745S
IC2
12.4
11.9
D5
R16 22K
C2 0.1 MY
R15 22K
D3
D4
R11 22K
R12 22K
STOP
START
R9 680K
R10 680K
TP-1
IC2 MSM4011
IC1 MSM4011
IC1
DIODE: MA150
D2
R7 22K
R8 22K
R6 100K
C1 0.001 MY
R5 100K
R4 15K
X1 2SC2647C
R3 47K
R2 22K
X3 2SC2647C
R1 47K
0 8 TIMING PHASE
P1
P2
11
12
13
14
15
16
17
21
22
23
24
25
26
GND
FLIP FLOP OUT
MOTOR CONTROL IN
UNREG ① IN
TIMING PAUSE OUT
PAUSE ① IN
12V IN
UNREG ① OUT
MOTOR CONTROL OUT
FLIP FLOP IN
GND
PAUSE ① OUT
PAUSE ② IN

NOTE: DC voltages are measured with a VTVM during SP recording.

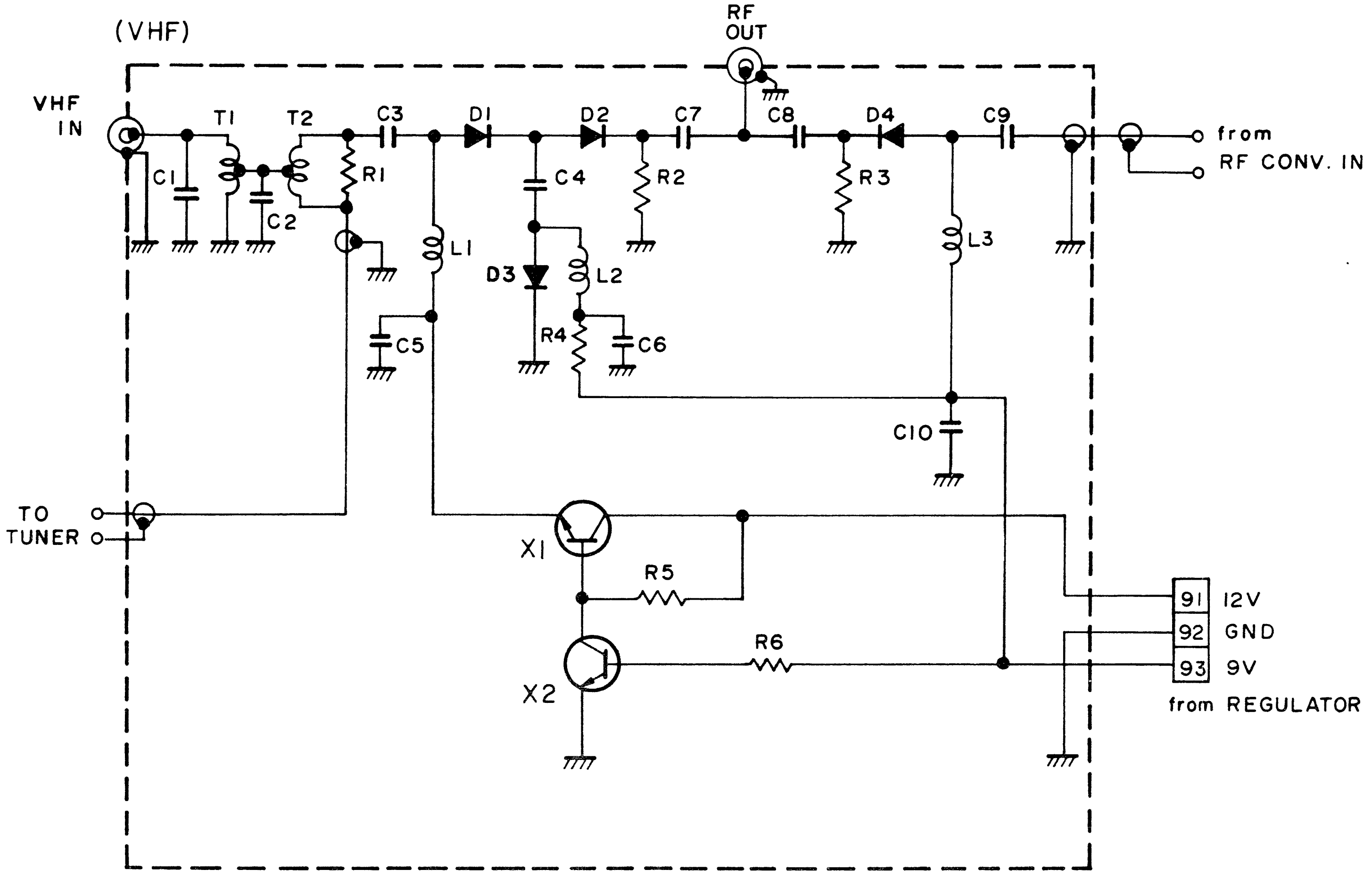
8.27 TIMING PHASE CIRCUIT BOARD

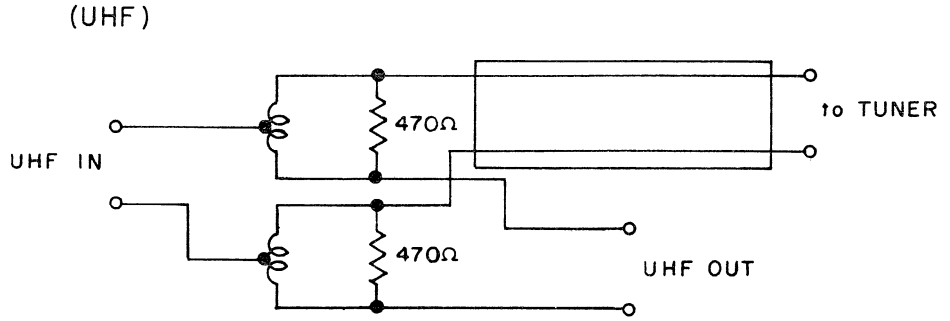

A
B
C
D
E
F
1
2
3
4
5
6
7
8
9
R5
R6
C1
R7
E C B
X1
R4
R3
D2
R8
B C E
X3
R2
①
R1
②
IC 1
14
1
8
7
③
④
R18
21
26
11
17
X2
E C B
D6
R19
C2
R17
D5
R16
IC 2
7
8
1
14
⑤
R15
TP-1
D3
D4
R12
R 10
START
R 9
STOP
R11
0 8
TIMING PHASE

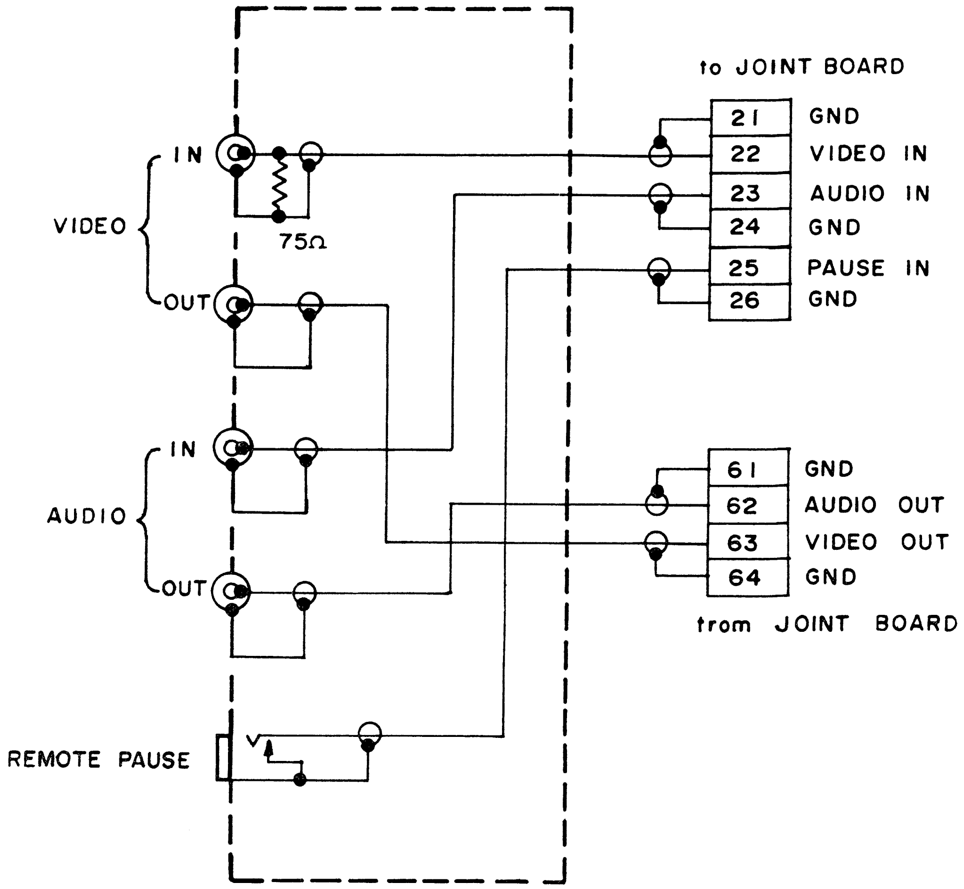
8.28 CONNECTOR PANEL CIRCUIT SCHEMATIC DIAGRAM

A B C D E F G H I J K L M N

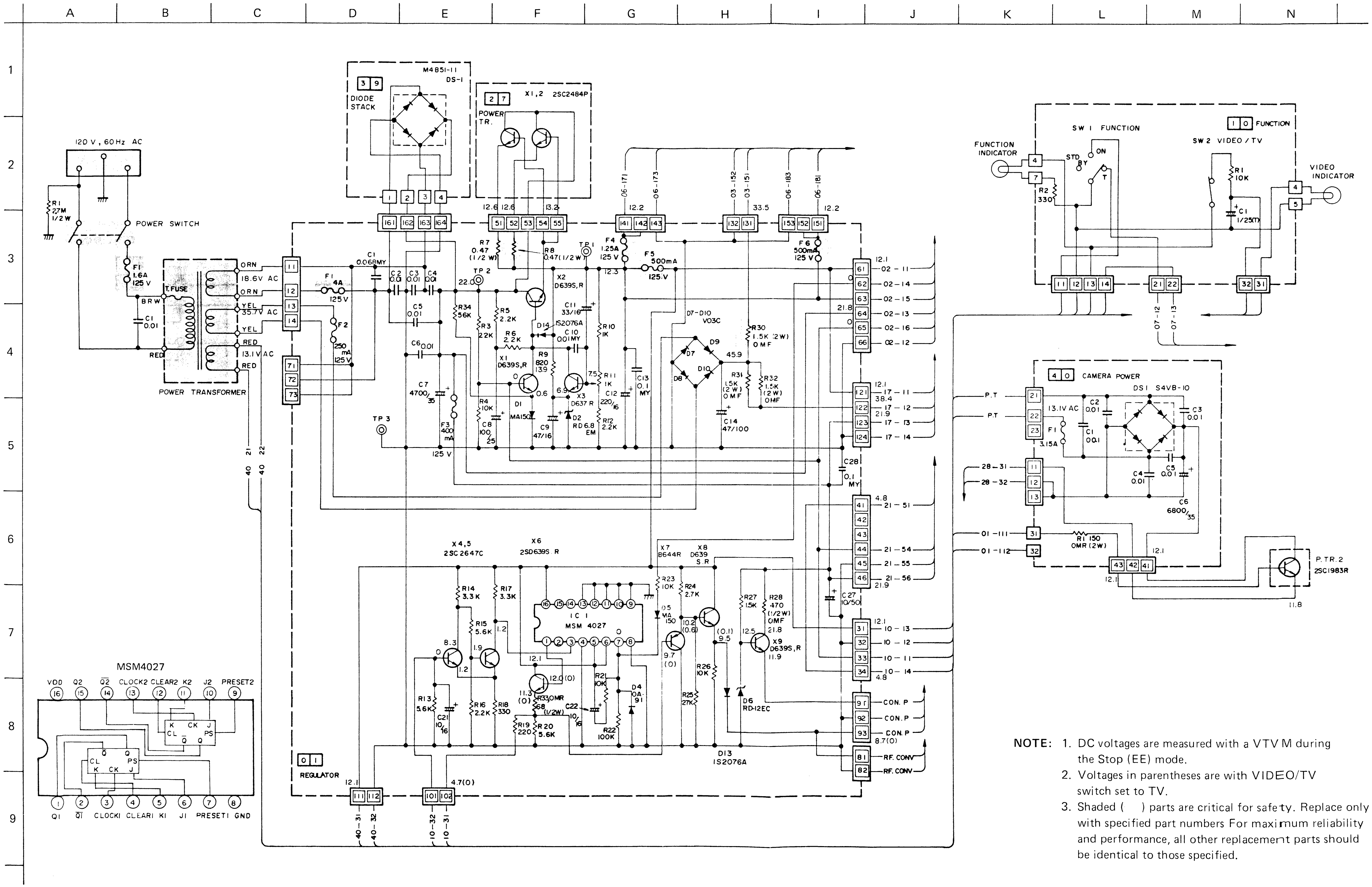
1 2 3 4 5 6 7 8 9


(VHF)
RF OUT
VHF IN
T1
T2
C3
D1
D2
C7
C8
D4
C9
C1
C2
R1
C4
R2
R3
L1
D3
L2
L3
C5
R4
C6
C10
TO TUNER
X1
R5
X2
R6
from RF CONV. IN
91 12V
92 GND
93 9V
from REGULATOR


(UHF)
UHF IN
470Ω
470Ω
to TUNER
UHF OUT


to JOINT BOARD
21 GND
22 VIDEO IN
23 AUDIO IN
24 GND
25 PAUSE IN
26 GND
VIDEO
IN
OUT
75Ω
AUDIO
IN
OUT
61 GND
62 AUDIO OUT
63 VIDEO OUT
64 GND
from JOINT BOARD
REMOTE PAUSE

8.29 REGULATOR, FUNCTION AND CAMERA POWER CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
120 V, 60Hz AC
R1 2.7M 1/2W
POWER SWITCH
F1 1.6A 125 V
T.FUSE
BRW
C1 0.01
RED
ORN
18.6V AC
YEL
35.7V AC
13.1V AC
POWER TRANSFORMER
M4851-11 DS-1
DIODE STACK
X1,2 2SC2484P
POWER TR.
R7 0.47 (1/2 W)
R8 0.47(1/2 W)
TP 1
TP 2
TP 3
F4 1.25A 125 V
F5 500mA 125 V
F6 500mA 125 V
F2 250 mA 125V
F3 400 mA 125 V
C1 0.068MY
C7 4700/35
X2 D639S,R
X1 D639S,R
X3 D637 R
D1 MA150
D2 RD6.8 EM
D14 1S2076A
D7-D10 V03C
R30 1.5K (2W) OMF
R31 1.5K (2W) OMF
R32 1.5K (2W) OMF
C14 47/100
C28 0.1 MY
X4,5 2SC2647C
X6 2SD639S R
X7 B644R
X8 D639 S R
X9 D639S,R
IC1 MSM 4027
D4 OA-91
D6 RD-12EC
D13 1S2076A
C27 10/50
REGULATOR
CON. P
RF. CONV
SW1 FUNCTION
SW2 VIDEO / TV
FUNCTION
FUNCTION INDICATOR
VIDEO INDICATOR
STD BY
ON
T
R1 10K
R2 330
C1 1/25M
CAMERA POWER
DS1 S4VB-10
13.1V AC
F1 3.15A
C6 6800/35
R1 150 OMR (2W)
P.TR.2 2SC1983R
P.T
MSM4027
VDD Q2 Q̄2 CLOCK2 CLEAR2 K2 J2 PRESET2
Q1 Q̄1 CLOCK1 CLEAR1 K1 J1 PRESET1 GND

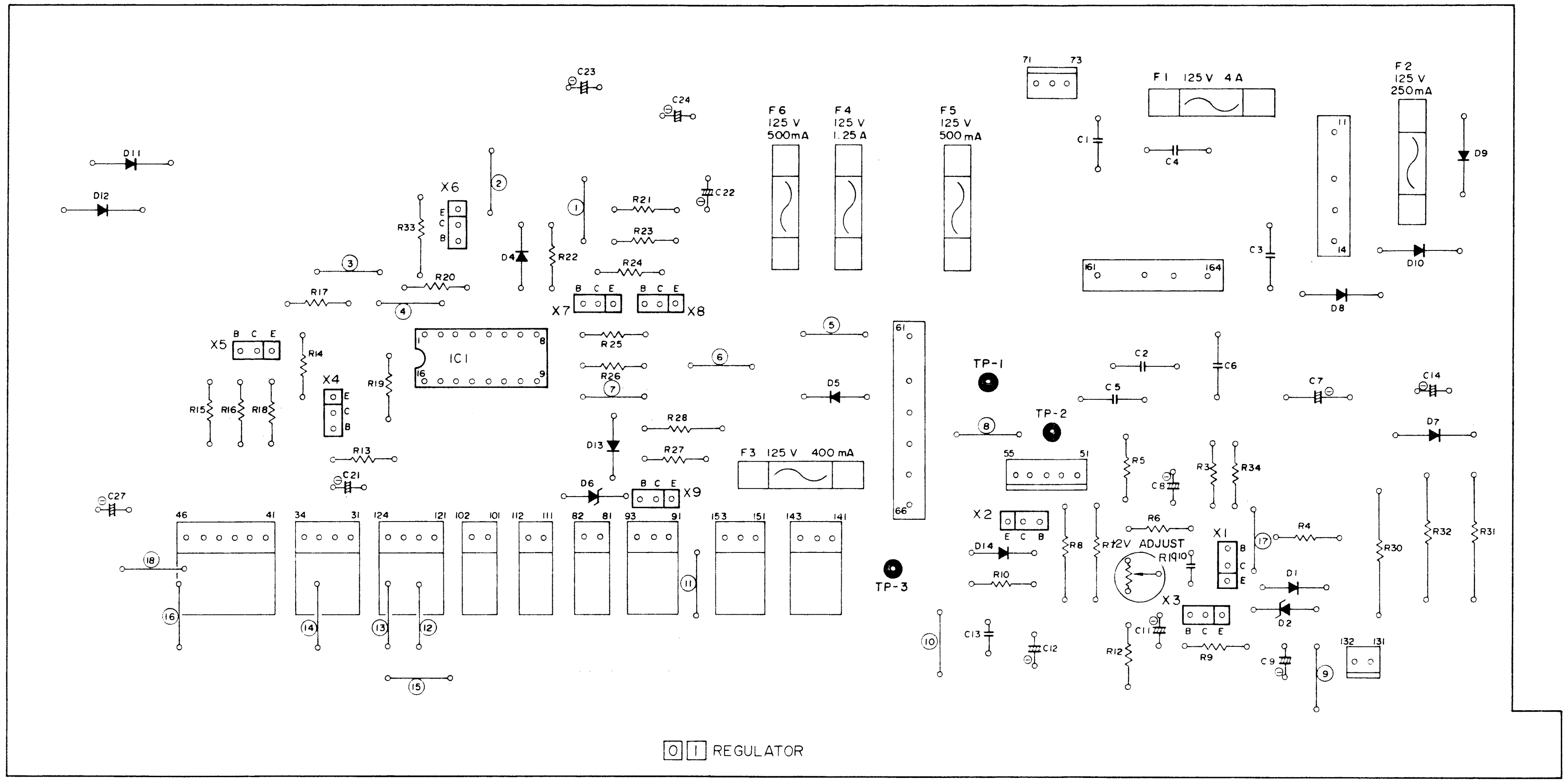
NOTE:
1. DC voltages are measured with a VTVM during the Stop (EE) mode.
2. Voltages in parentheses are with VIDEO/TV switch set to TV.
3. Shaded ( ) parts are critical for safety. Replace only with specified part numbers For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.30 REGULATOR CIRCUIT BOARD, FUNCTION BOARD, CAMERA POWER BOARD, POWER TRANSISTOR BOARD AND DIODE STACK BOARD

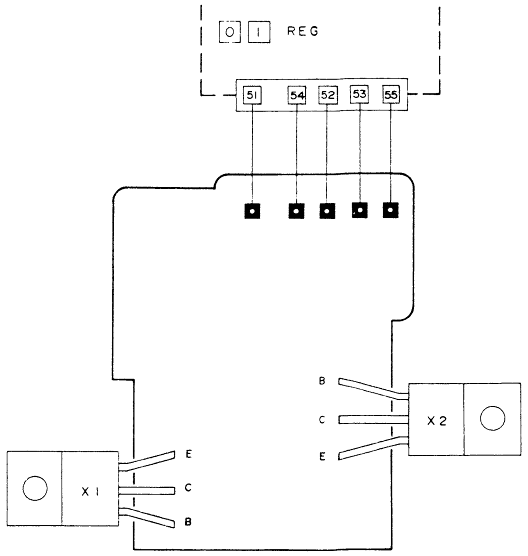
A B C D E F G H I J K L M N

1 2 3 4 5 6 7 8 9

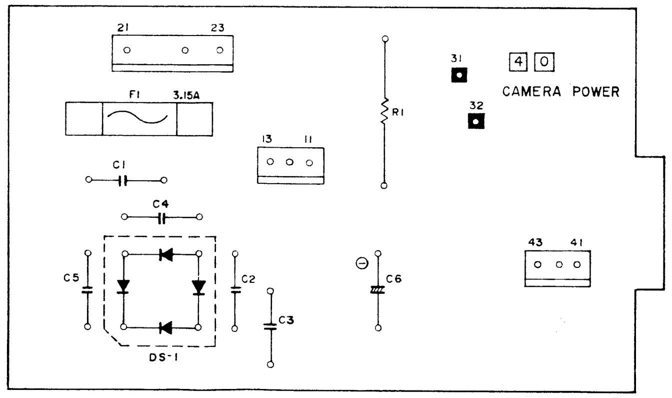
— REGULATOR BOARD —


F6 125 V 500mA
F4 125 V 1.25 A
F5 125 V 500 mA
F1 125V 4A
F2 125 V 250mA
F3 125 V 400 mA
IC1
X1
X2
X3
X4
X5
X6
X7
X8
X9
TP-1
TP-2
TP-3
R12V ADJUST R19
D1
D2
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
C1
C2
C3
C4
C5
C6
C7
C8
C9
C11
C12
C13
C14
C21
C22
C23
C24
C27
R3
R4
R5
R6
R8
R9
R10
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R30
R31
R32
R33
R34
B C E
0 1 REGULATOR

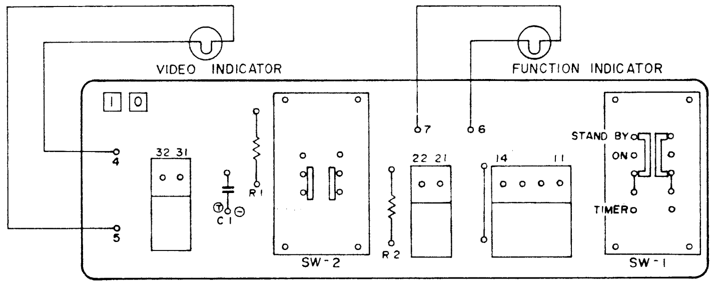
— POWER TRANSISTOR BOARO —


0 1 REG
51
54
52
53
55
X1
X2
B
C
E

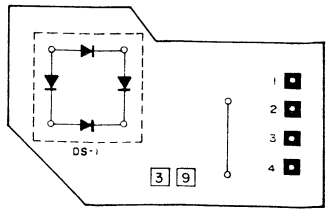
— CAMERA POWER BOARD —


21
23
F1 3.15A
13
11
R1
31
32
4 0
CAMERA POWER
C1
C2
C3
C4
C5
C6
DS-1
43
41

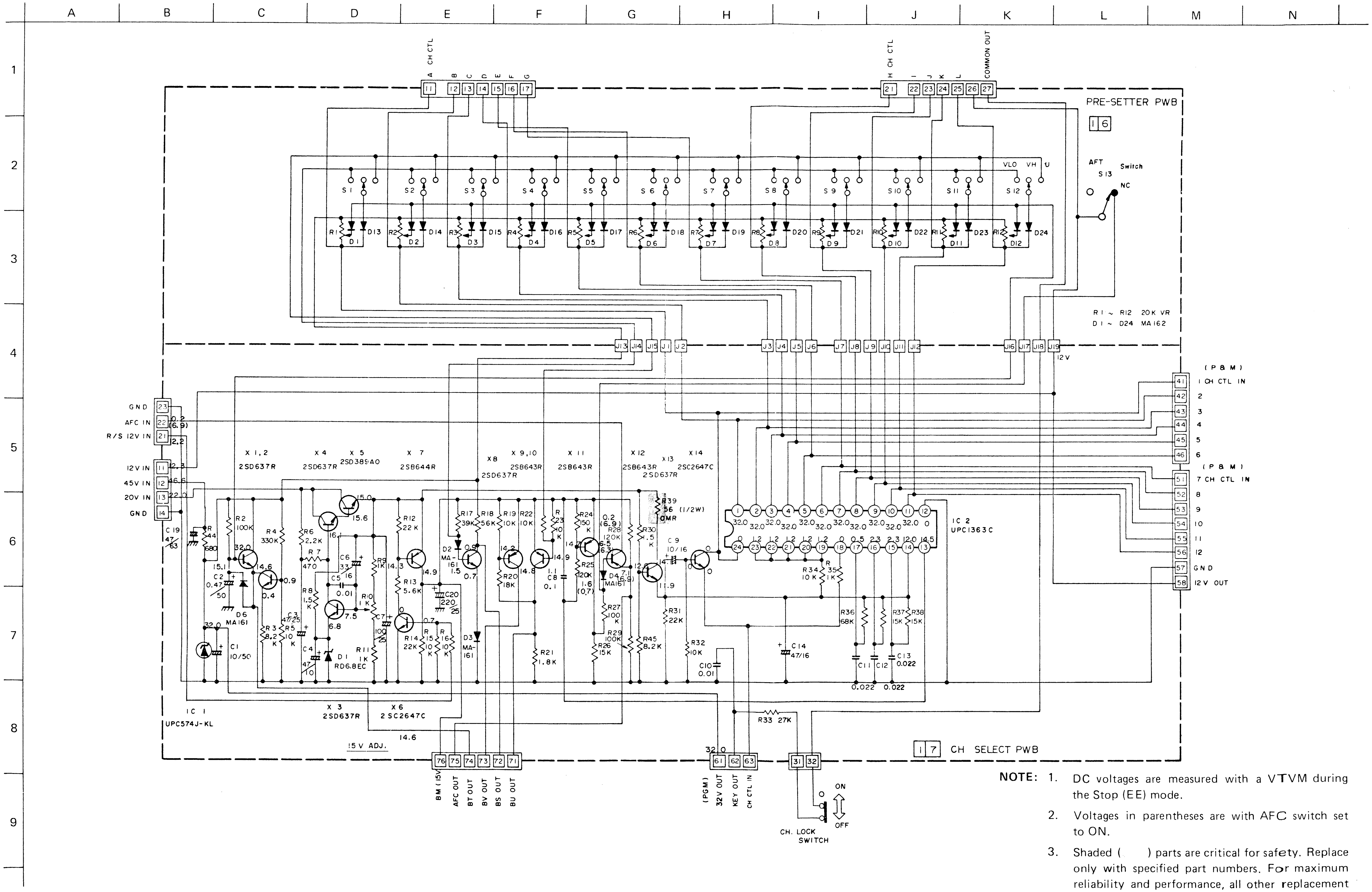
— FUNCTION BOARD —


VIDEO INDICATOR
FUNCTION INDICATOR
1 0
32 31
R1
C1
SW-2
22 21
R2
14
11
STAND BY
ON
TIMER
SW-1
4
5
7
6

— DIODE STACK BOARD —



8.31 PRE-SETTER AND CHANNEL SELECTOR CIRCUIT SCHEMATIC DIAGRAM

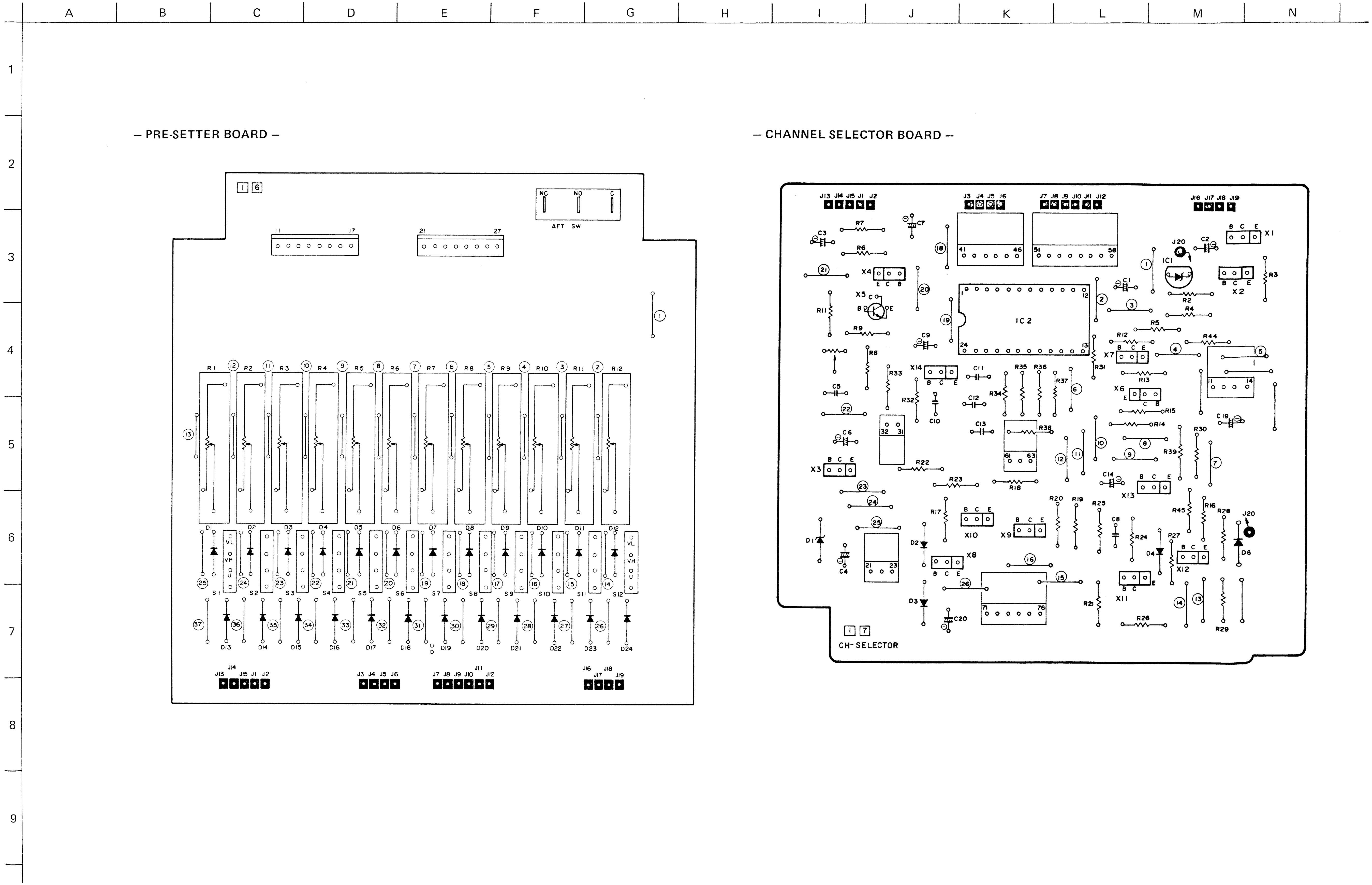


A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
A CH CTL
B C D E F G
H CH CTL
I J K L
COMMON OUT
PRE-SETTER PWB
16
VLO VH U
AFT S13 Switch NC
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12
R1 ~ R12 20K VR
D1 ~ D24 MA162
12V
(P B M)
1 CH CTL IN
7 CH CTL IN
GND
12V OUT
AFC IN
R/S 12V IN
12V IN
45V IN
20V IN
X1,2 2SD637R
X4 2SD637R
X5 2SD389AO
X7 2SB644R
X8 2SD637R
X9,10 2SB643R
X11 2SB643R
X12 2SB643R
X13 2SD637R
X14 2SC2647C
X3 2SD637R
X6 2SC2647C
IC 1 UPC574J-KL
IC 2 UPC1363C
R39 56 (1/2W) OMR
R33 27K
15V ADJ.
BM (15V)
AFC OUT
BT OUT
BV OUT
BS OUT
BU OUT
(PGM)
32V OUT
KEY OUT
CH CTL IN
ON
OFF
CH. LOCK SWITCH
17 CH SELECT PWB

NOTE:

1. DC voltages are measured with a VTVM during the Stop (EE) mode.
2. Voltages in parentheses are with AFC switch set to ON.
3. Shaded ( ) parts are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.32 PRE-SETTER AND CHANNEL SELECTOR CIRCUIT BOARD

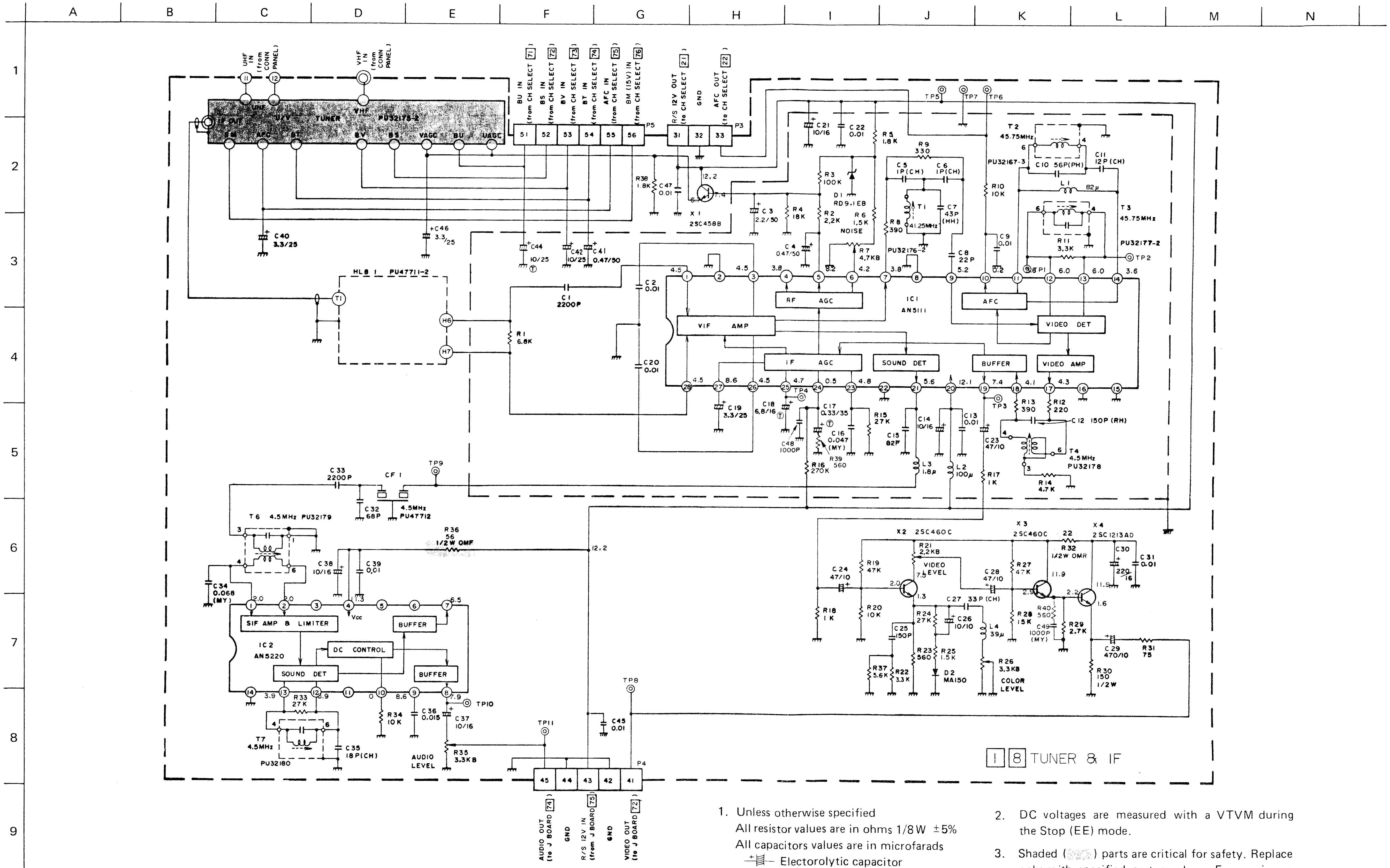


– PRE-SETTER BOARD –

– CHANNEL SELECTOR BOARD –

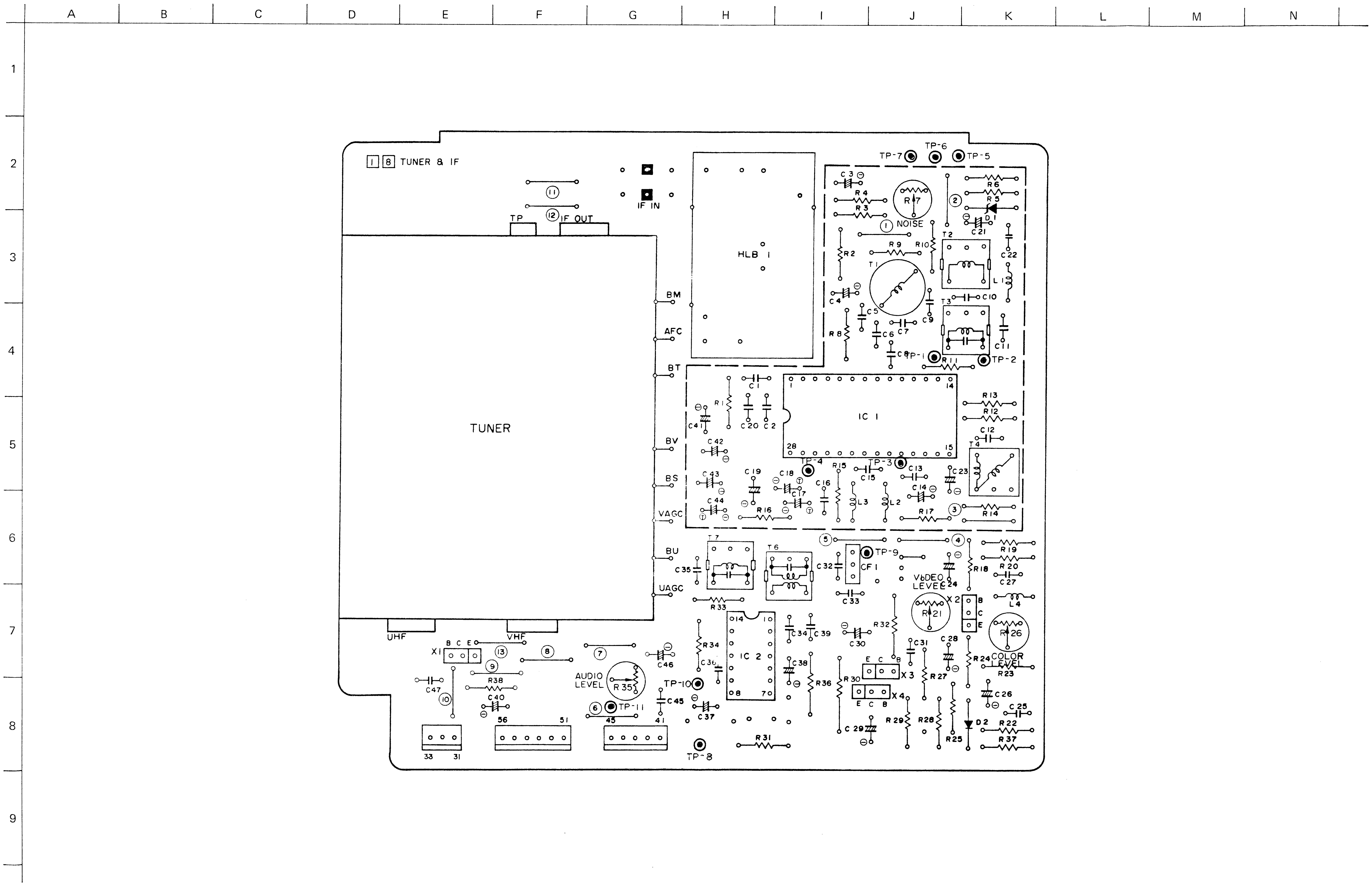
A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
16
NC
NO
C
AFT SW
11
17
21
27
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
VL
VH
U
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
J13
J14
J15
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J16
J17
J18
J19
IC1
IC2
J20
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14
B C E
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C19
C20
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R44
R45
41
46
51
58
61
63
71
76
32
31
21
23
D1
D2
D3
D4
D6
17
CH-SELECTOR

8.33 TUNER AND IF CIRCUIT SCHEMATIC DIAGRAM

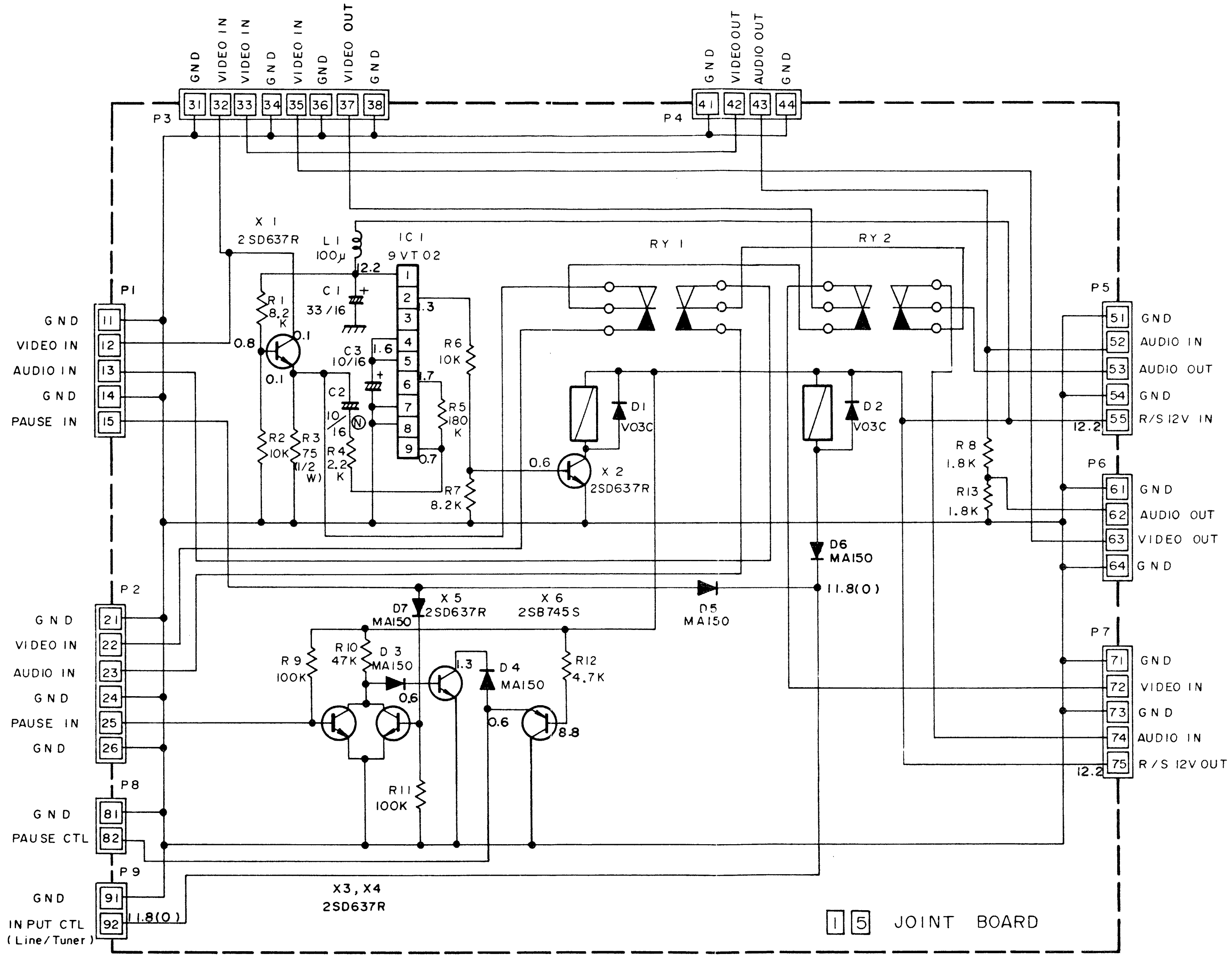

A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
UHF IN (from CONN PANEL)
VHF IN (from CONN PANEL)
TUNER PU32175-2
IF OUT
BM
AFC
BT
BV
BS
VAGC
BU
UAGC
BU IN (from CH SELECT 71)
BS IN (from CH SELECT 72)
BV IN (from CH SELECT 73)
BT IN (from CH SELECT 74)
AFC IN (from CH SELECT 75)
BM (15V) IN (from CH SELECT 76)
R/S 12V OUT (to CH SELECT 21)
GND
AFC OUT (to CH SELECT 22)
P5
P3
X1 2SC458B
HL8 1 PU47711-2
C1 2200P
R1 6.8K
C40 3.3/25
C46 3.3/25
TP5
TP7
TP6
T2 45.75MHz PU32167-3
T1 41.25MHz PU32176-2
T3 45.75MHz PU32177-2
TP2
D1 RD9.1EB
NOISE
IC1 AN5111
RF AGC
VIF AMP
AFC
VIDEO DET
IF AGC
SOUND DET
BUFFER
VIDEO AMP
TP4
TP3
T4 4.5MHz PU32178
C33 2200P
CF1
TP9
C32 68P
4.5MHz PU47712
T6 4.5MHz PU32179
R36 56 1/2W OMF
12.2
IC2 AN5220
SIF AMP & LIMITER
BUFFER
DC CONTROL
SOUND DET
BUFFER
Vcc
TP10
TP11
TP8
T7 4.5MHz PU32180
AUDIO LEVEL
R35 3.3KB
C45 0.01
P4
45 44 43 42 41
AUDIO OUT (to J BOARD 74)
GND
R/S 12V IN (from J BOARD 75)
GND
VIDEO OUT (to J BOARD 72)
X2 2SC460C
X3 2SC460C
X4 2SC1213AD
VIDEO LEVEL
COLOR LEVEL
D2 MA150
R32 1/2W OMR
R30 150 1/2W
C29 470/10
R31 75
1 8 TUNER & IF

1. Unless otherwise specified
   All resistor values are in ohms 1/8W ±5%
   All capacitors values are in microfarads
   - ⊣⊢ Electorolytic capacitor
   - ⊣⊢ Ceramic capacitor
   - ⊣⊢MY Mylar capacitor
   - ⊣⊢(TAN) Tantal capacitor
2. DC voltages are measured with a VTVM during the Stop (EE) mode.
3. Shaded (▨) parts are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

8.34 TUNER AND IF CIRCUIT BOARD

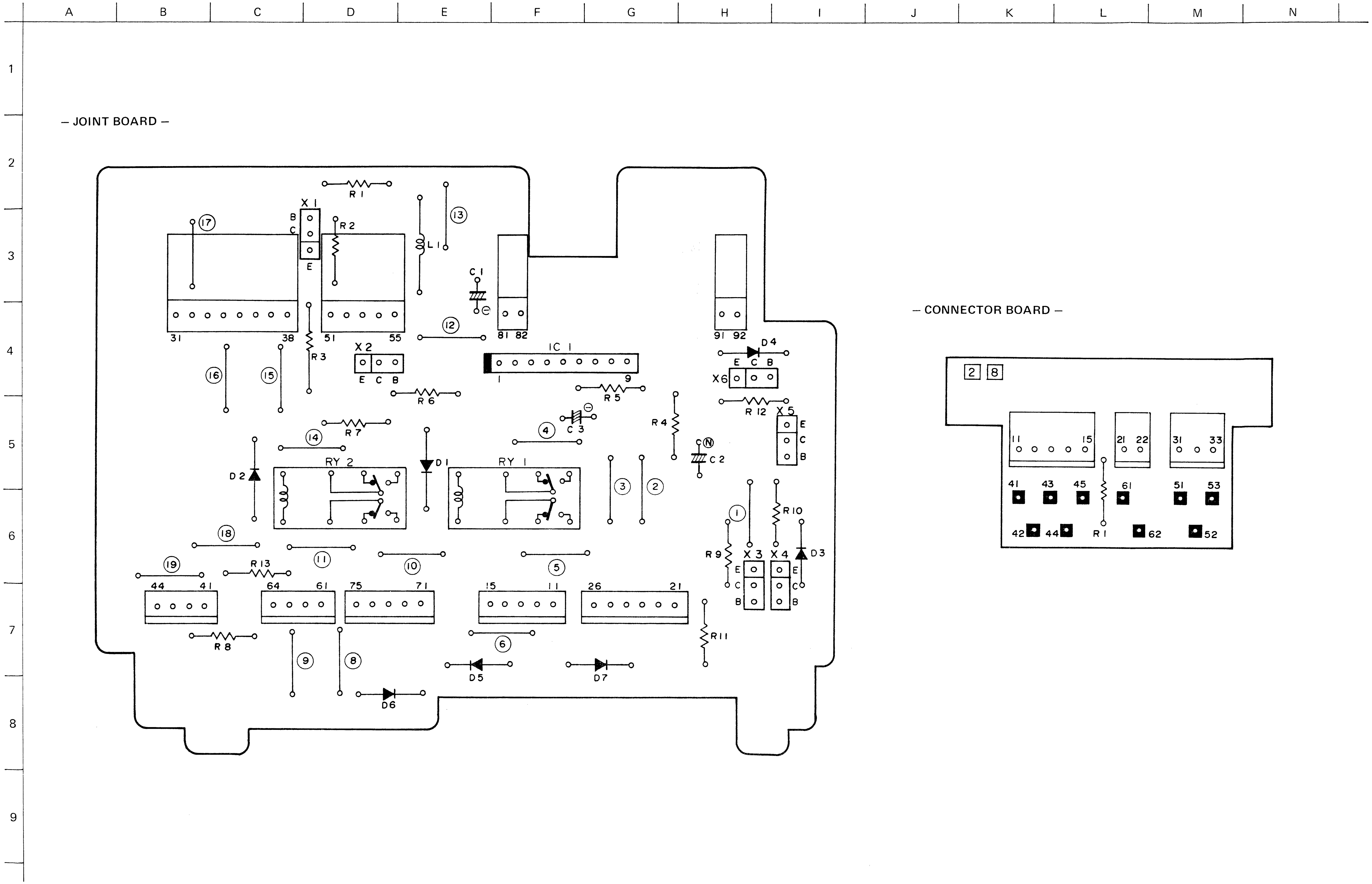

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
1 8 TUNER & IF
TP
⑪
⑫ IF OUT
IF IN
HLB 1
TUNER
BM
AFC
BT
BV
BS
VAGC
BU
UAGC
UHF
VHF
TP-7
TP-6
TP-5
TP-1
TP-2
TP-3
TP-4
TP-8
TP-9
TP-10
TP-11
① NOISE
R 7
R 2
R 3
R 4
R 5
R 6
R 8
R 9
R 10
R 11
R 12
R 13
R 14
R 15
R 16
R 17
R 18
R 19
R 20
R 21
R 22
R 23
R 24
R 25
R 26
R 27
R 28
R 29
R 30
R 31
R 32
R 33
R 34
R 35
R 36
R 37
R 38
R 1
C 1
C 2
C 3
C 4
C 5
C 6
C 7
C 8
C 9
C 10
C 11
C 12
C 13
C 14
C 15
C 16
C 17
C 18
C 19
C 20
C 21
C 22
C 23
C 24
C 25
C 26
C 27
C 28
C 29
C 30
C 31
C 32
C 33
C 34
C 35
C 36
C 37
C 38
C 39
C 40
C 41
C 42
C 43
C 44
C 45
C 46
C 47
T 1
T 2
T 3
T 4
T 6
T 7
L 1
L 2
L 3
L 4
D 1
D 2
IC 1
IC 2
CF 1
X 1
X 2
X 3
X 4
B C E
E C B
VIDEO LEVEL
COLOR LEVEL
AUDIO LEVEL
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑬
1
14
15
28
33
31
56
51
45
41

8.35 JOINT CIRCUIT SCHEMATIC DIAGRAM


A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
P3
31 GND
32 VIDEO IN
33 VIDEO IN
34 GND
35 VIDEO IN
36 GND
37 VIDEO OUT
38 GND
P4
41 GND
42 VIDEO OUT
43 AUDIO OUT
44 GND
P1
11 GND
12 VIDEO IN
13 AUDIO IN
14 GND
15 PAUSE IN
P2
21 GND
22 VIDEO IN
23 AUDIO IN
24 GND
25 PAUSE IN
26 GND
P8
81 GND
82 PAUSE CTL
P9
91 GND
92 INPUT CTL (Line/Tuner)
11.8(0)
P5
51 GND
52 AUDIO IN
53 AUDIO OUT
54 GND
55 R/S 12V IN
12.2
P6
61 GND
62 AUDIO OUT
63 VIDEO OUT
64 GND
P7
71 GND
72 VIDEO IN
73 GND
74 AUDIO IN
75 R/S 12V OUT
12.2
X1 2SD637R
L1 100μ
IC1 9VT02
12.2
C1 33/16
R1 8.2K
0.8
0.1
0.1
C3 10/16
1.6
.3
.7
C2 10/16
R6 10K
R5 180K
R2 10K
R3 75 (1/2W)
R4 2.2K
0.7
R7 8.2K
0.6
X2 2SD637R
RY1
RY2
D1 VO3C
D2 VO3C
R8 1.8K
R13 1.8K
D6 MA150
11.8(0)
D5 MA150
X5 2SD637R
D7 MA150
X6 2SB745S
R9 100K
R10 47K
D3 MA150
0.6
1.3
D4 MA150
R12 4.7K
0.6
8.8
R11 100K
X3, X4 2SD637R
15 JOINT BOARD

NOTE: 1. DC voltages are measured with a VTVM during the Stop (EE) mode.
2. Voltages in parentheses are with REC. SELECT switch set to TV.

8.36 JOINT CIRCUIT BOARD AND CONNECTOR BOARD

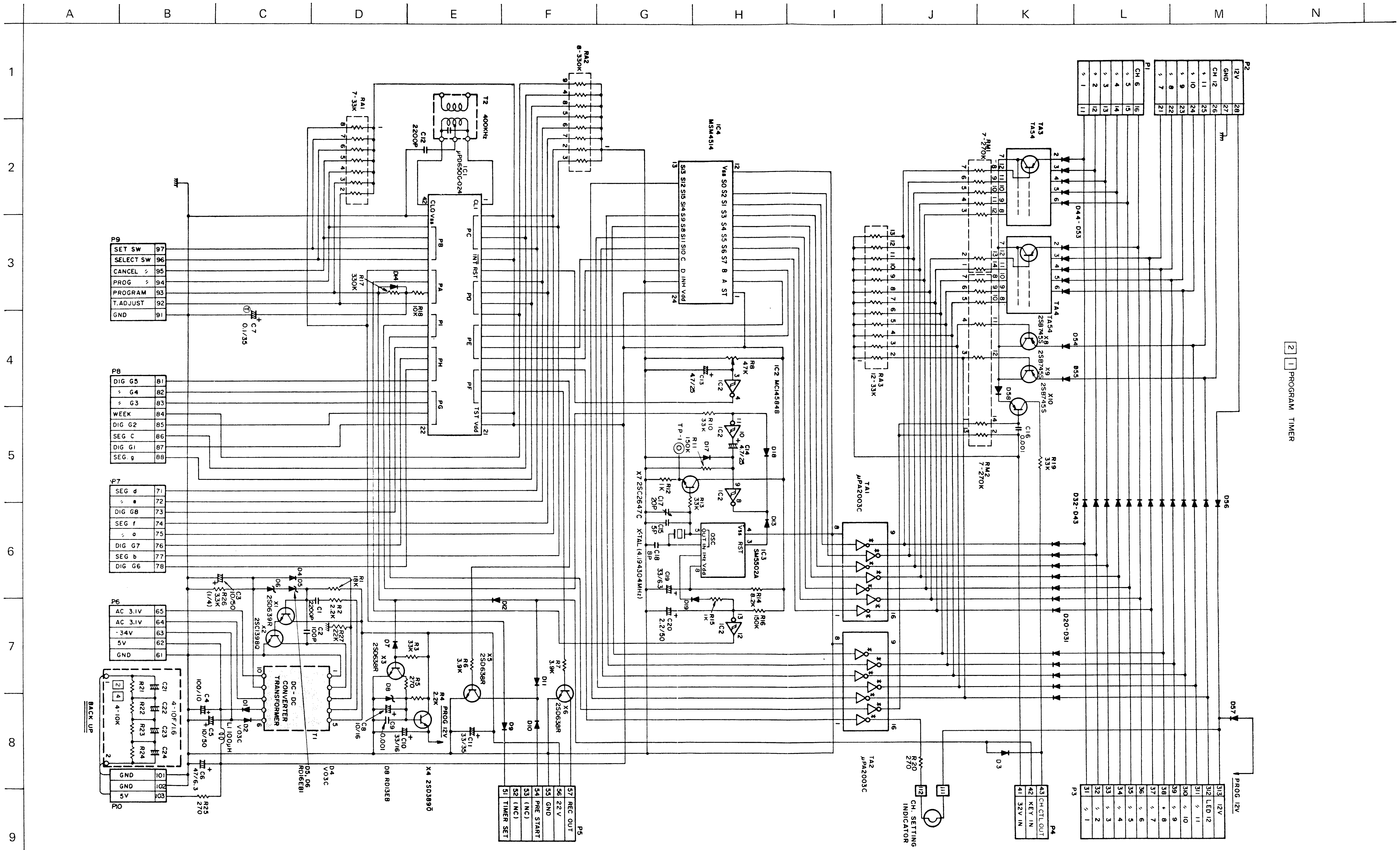


– JOINT BOARD –

– CONNECTOR BOARD –

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
R 1
X 1
B
C
E
R 2
L 1
⑬
⑰
C 1
31
38
51
55
81 82
91 92
⑫
X 2
E C B
IC 1
1
9
D 4
E C B
X6
R 3
⑯
⑮
R 6
R 5
R 12
X 5
E
C
B
R 4
C 3
④
R 7
⑭
C 2
RY 2
D 1
RY 1
D 2
③
②
①
R 10
⑱
⑪
⑩
⑤
R 9
X 3
X 4
D 3
⑲
R 13
44
41
64
61
75
71
15
11
26
21
R 8
⑨
⑧
⑥
R 11
D 5
D 7
D 6
2
8
11
15
21 22
31
33
41
43
45
61
51
53
42
44
R 1
62
52

8.37 TIMER CIRCUIT SCHEMATIC DIAGRAM

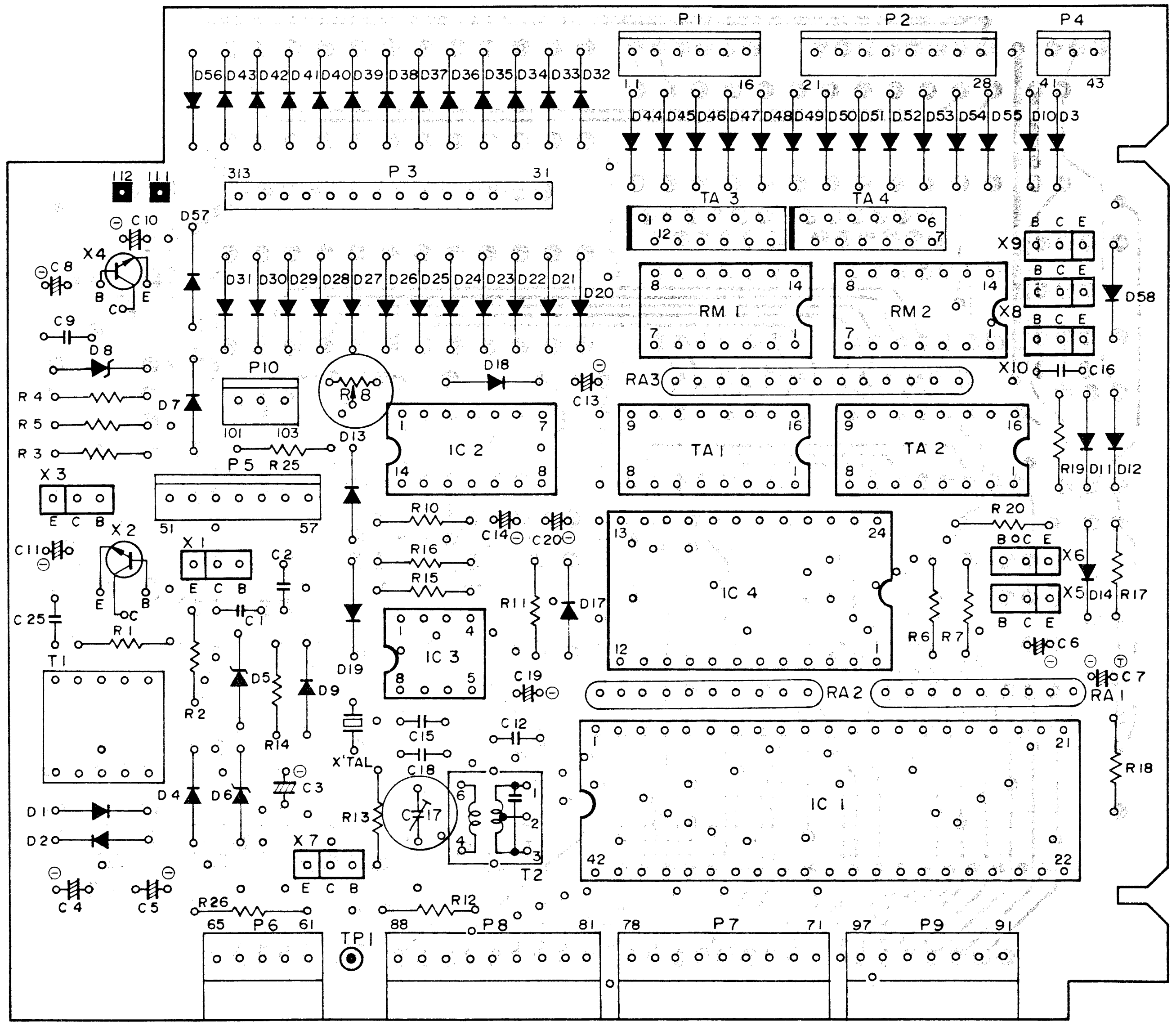

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
P9
SET SW 97
SELECT SW 96
CANCEL 95
PROG 94
PROGRAM 93
T.ADJUST 92
GND 91
P8
DIG G5 81
G4 82
G3 83
WEEK 84
DIG G2 85
SEG C 86
DIG G1 87
SEG g 88
P7
SEG d 71
e 72
DIG G8 73
SEG f 74
a 75
DIG G7 76
SEG b 77
DIG G6 78
P6
AC 3.1V 65
AC 3.1V 64
-34V 63
5V 62
GND 61
BACK UP
GND 101
GND 102
5V 103
P10
RA1 7-33K
RA2 8-330K
T2 400KHz
C12 2200P
IC1 μPD650C-024
IC4 MSM4514
IC2 MC14584B
IC3 SM5502A
X7 2SC2647C
XTAL (4.194304MHz)
TA1 μPA2003C
TA2 μPA2003C
TA3 TA54
TA4 TA54
RM1 7-270K
RM2 7-270K
RA3 12 33K
DC-DC CONVERTER TRANSFORMER
T1
P5
51 TIMER SET
52 (NC)
53 (NC)
54 PRE START
55 GND
56 22V
57 REC OUT
P4
41 32V IN
42 KEY IN
43 CH CTL OUT
CH. SETTING INDICATOR
P3
P1
P2
12V
GND
PROG 12V
PROGRAM TIMER

NOTES: **Unless other wise specified**

1. All resistors are cabon resistors in ohms (1/8W)
2. All capacitors are in micro farads.
3. All diodes are MA162.
4. Shaded (▨) parts are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

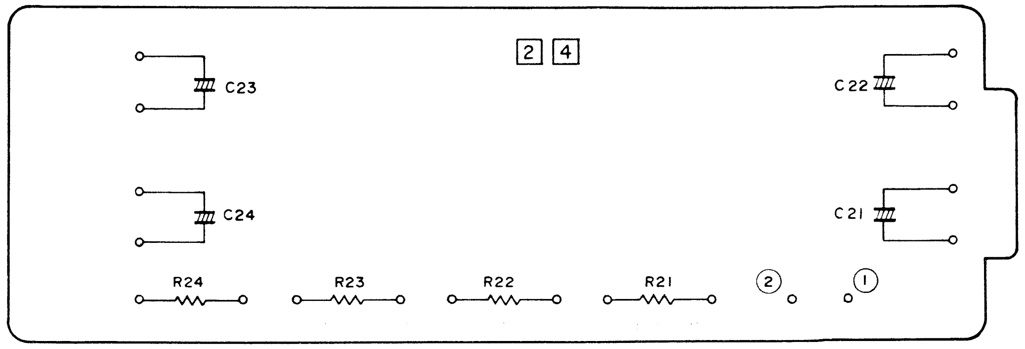
8.38 TIMER CIRCUIT BOARD AND BACK-UP BOARD

– TIMER BOARD –



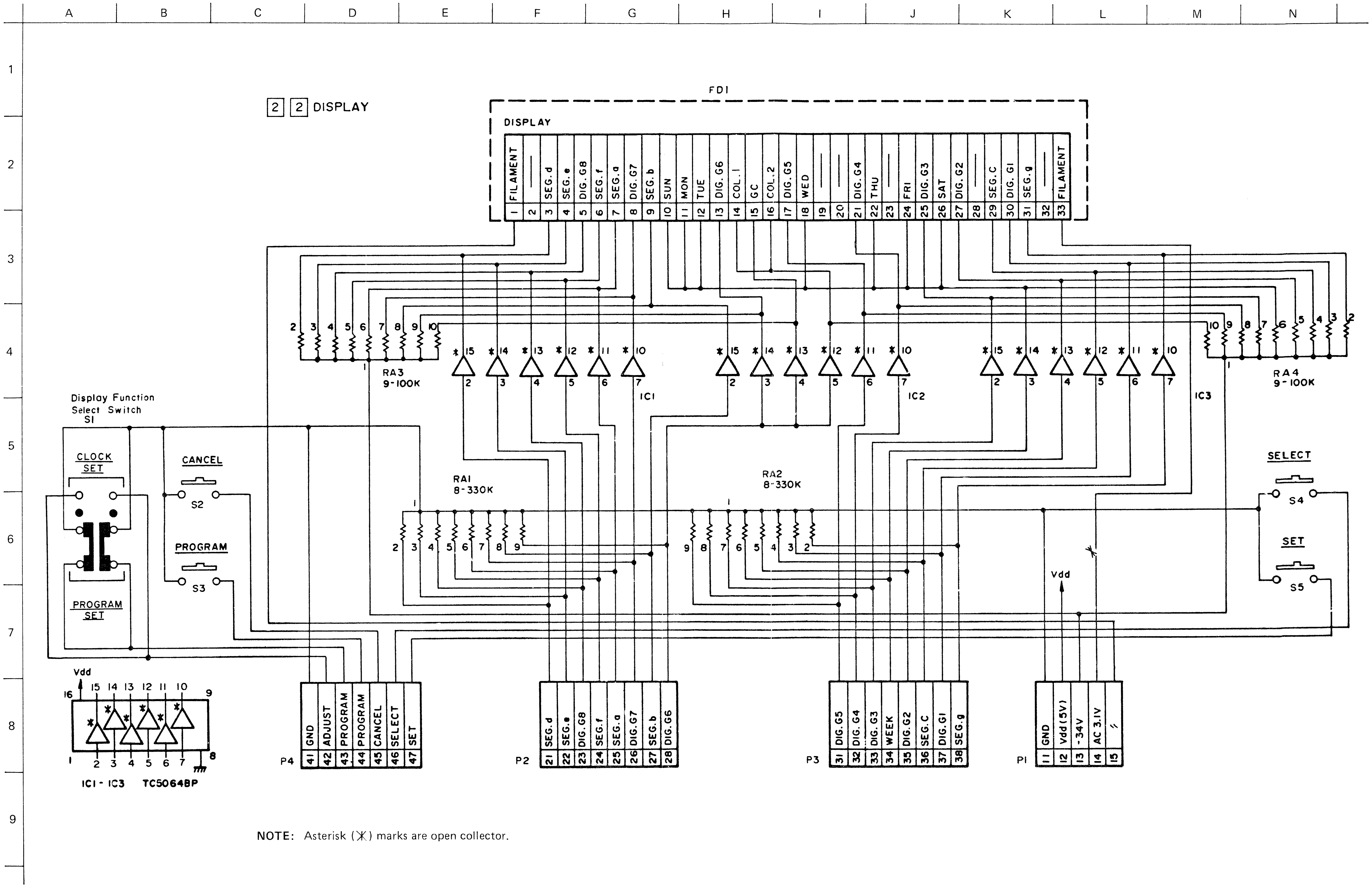
P1
P2
P4
P3
P5
P6
P7
P8
P9
P10
D56 D43 D42 D41 D40 D39 D38 D37 D36 D35 D34 D33 D32
D44 D45 D46 D47 D48 D49 D50 D51 D52 D53 D54 D55 D10 D3
D31 D30 D29 D28 D27 D26 D25 D24 D23 D22 D21 D20
D57
D58
TA 3
TA 4
TA 1
TA 2
RM 1
RM 2
RA3
RA 2
RA 1
IC 1
IC 2
IC 3
IC 4
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
R18
T1
T2
TP1
X'TAL
C17

– BACK-UP BOARD –



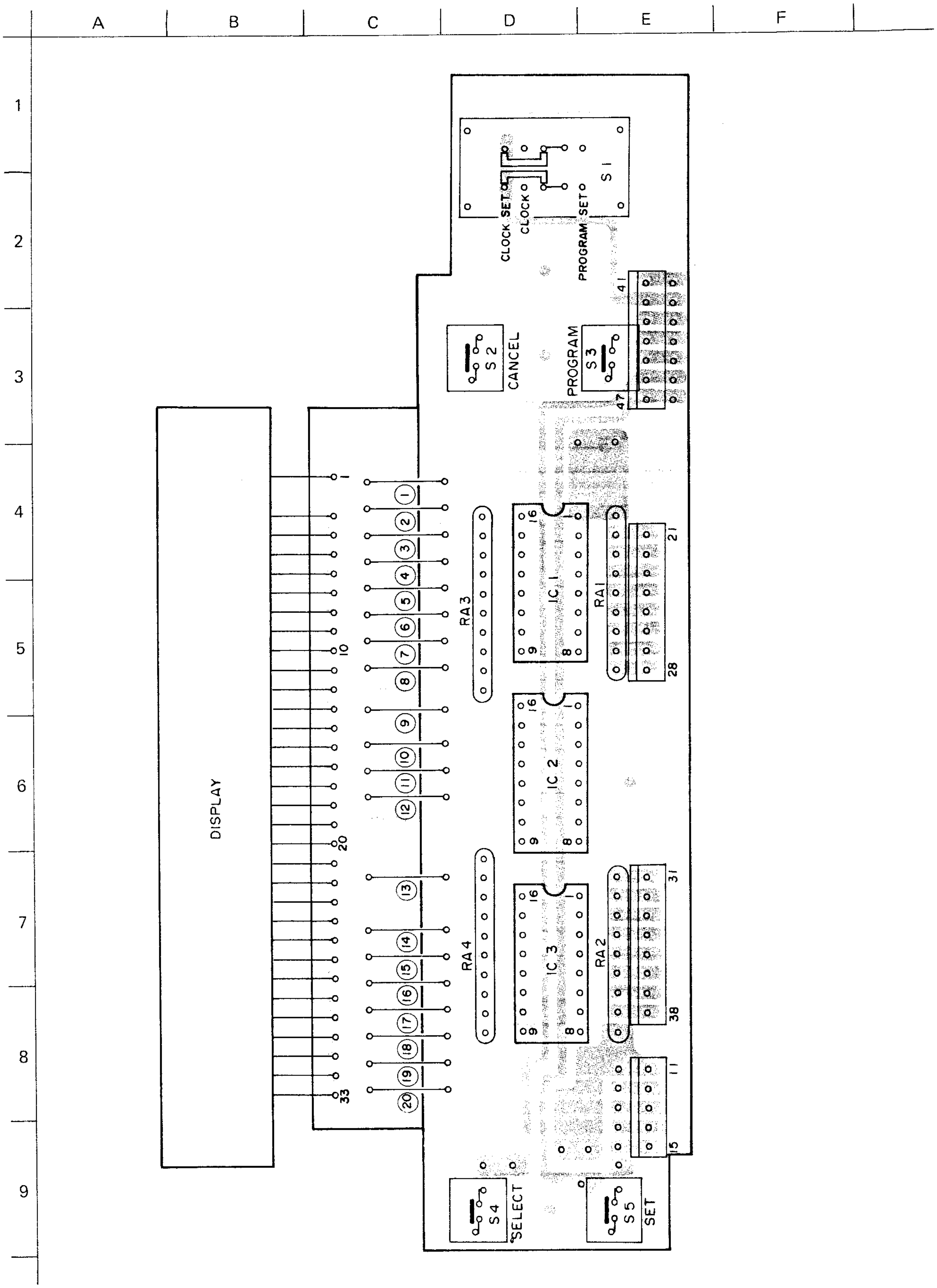
2 4
C23
C24
C22
C21
R24
R23
R22
R21
②
①

8.39 DISPLAY CIRCUIT SCHEMATIC DIAGRAM

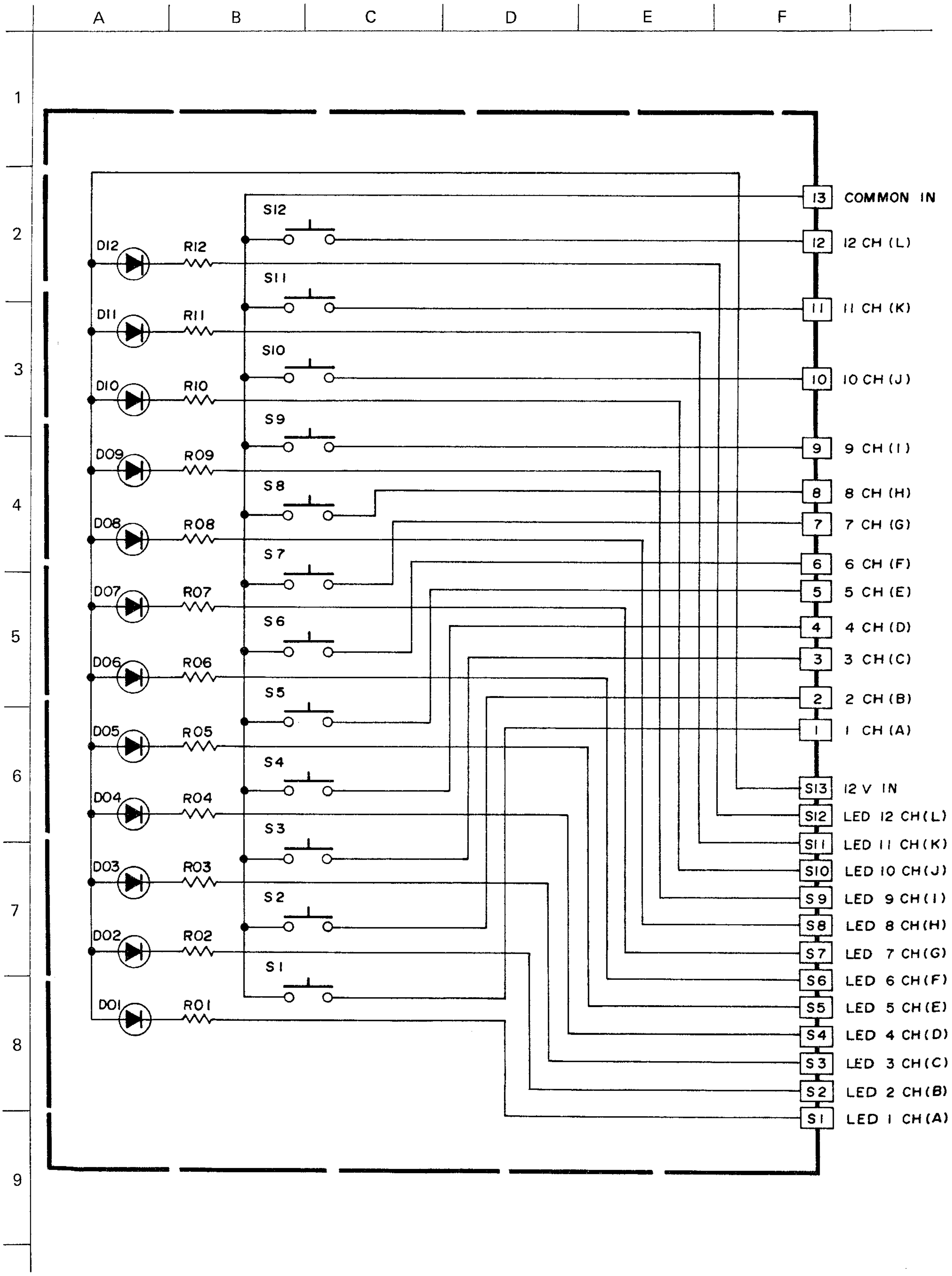

A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
2 2 DISPLAY
FD1
DISPLAY
1 FILAMENT
2
3 SEG.d
4 SEG.e
5 DIG.G8
6 SEG.f
7 SEG.a
8 DIG.G7
9 SEG.b
10 SUN
11 MON
12 TUE
13 DIG.G6
14 COL.1
15 GC
16 COL.2
17 DIG.G5
18 WED
19
20
21 DIG.G4
22 THU
23
24 FRI
25 DIG.G3
26 SAT
27 DIG.G2
28
29 SEG.C
30 DIG.G1
31 SEG.g
32
33 FILAMENT
RA3
9-100K
RA4
9-100K
IC1
IC2
IC3
RA1
8-330K
RA2
8-330K
Display Function Select Switch
S1
CLOCK SET
PROGRAM SET
CANCEL
S2
PROGRAM
S3
SELECT
S4
SET
S5
Vdd
P4
41 GND
42 ADJUST
43 PROGRAM
44 PROGRAM
45 CANCEL
46 SELECT
47 SET
P2
21 SEG.d
22 SEG.e
23 DIG.G8
24 SEG.f
25 SEG.a
26 DIG.G7
27 SEG.b
28 DIG.G6
P3
31 DIG.G5
32 DIG.G4
33 DIG.G3
34 WEEK
35 DIG.G2
36 SEG.C
37 DIG.G1
38 SEG.g
P1
11 GND
12 Vdd (5V)
13 -34V
14 AC 3.1V
15
Vdd
16 15 14 13 12 11 10 9
1 2 3 4 5 6 7 8
IC1 - IC3 TC5064BP

NOTE: Asterisk (✳) marks are open collector.

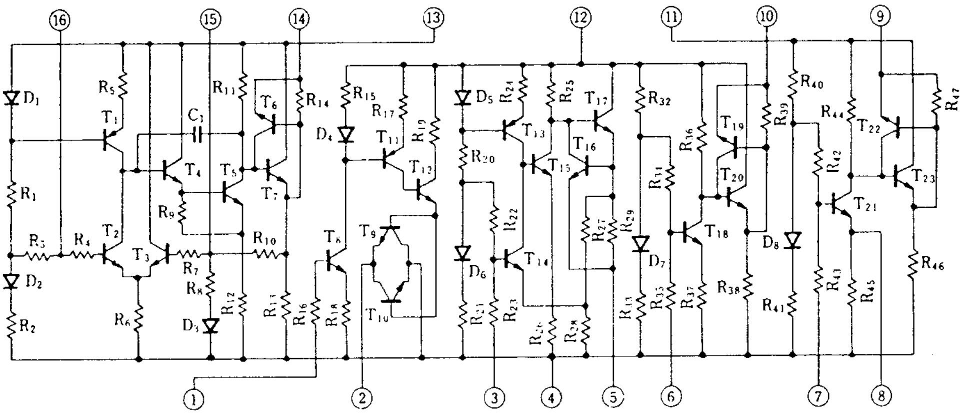
8.40 DISPLAY CIRCUIT BOARD

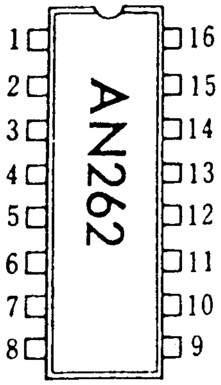

A
B
C
D
E
F
1
2
3
4
5
6
7
8
9
DISPLAY
S 1
CLOCK SET
CLOCK
PROGRAM SET
S 2
CANCEL
S 3
PROGRAM
S 4
SELECT
S 5
SET
IC 1
IC 2
IC 3
RA1
RA2
RA3
RA4
1
10
20
33
41
47
21
28
31
38
11
15
16
9
8
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳

8.41 CHANNEL SELECT SWITCH CIRCUIT SCHEMATIC DIAGRAM

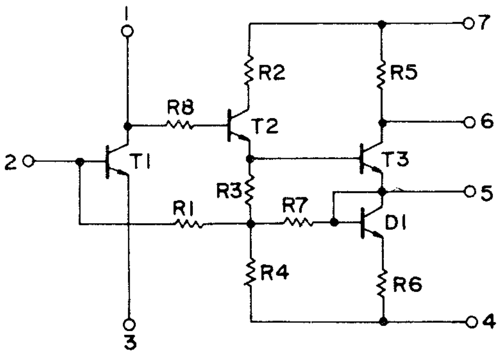

A
B
C
D
E
F
1
2
3
4
5
6
7
8
9
D12
D11
D10
D09
D08
D07
D06
D05
D04
D03
D02
D01
R12
R11
R10
R09
R08
R07
R06
R05
R04
R03
R02
R01
S12
S11
S10
S9
S8
S7
S6
S5
S4
S3
S2
S1
13 COMMON IN
12 12 CH (L)
11 11 CH (K)
10 10 CH (J)
9 9 CH (I)
8 8 CH (H)
7 7 CH (G)
6 6 CH (F)
5 5 CH (E)
4 4 CH (D)
3 3 CH (C)
2 2 CH (B)
1 1 CH (A)
S13 12 V IN
S12 LED 12 CH (L)
S11 LED 11 CH (K)
S10 LED 10 CH (J)
S9 LED 9 CH (I)
S8 LED 8 CH (H)
S7 LED 7 CH (G)
S6 LED 6 CH (F)
S5 LED 5 CH (E)
S4 LED 4 CH (D)
S3 LED 3 CH (C)
S2 LED 2 CH (B)
S1 LED 1 CH (A)

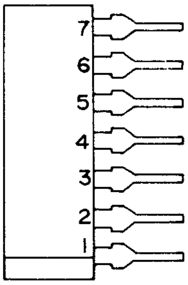
– AN262 –


⑯
⑮
⑭
⑬
⑫
⑪
⑩
⑨
D1
R5
T1
C1
R11
T6
R14
R15
R17
D4
T11
R19
T12
D5
R24
R25
T17
R32
R40
R44
T22
R47
R1
T4
T5
T7
R20
T13
T15
T16
R36
T19
R39
R42
T20
T21
T23
R9
T8
T9
R22
R27
R29
R31
T18
D8
R3
R4
T2
T3
R7
R10
D6
T14
D7
R38
R46
D2
R8
R12
R13
R16
R18
T10
R21
R23
R26
R28
R33
R35
R37
R41
R43
R45
R2
R6
D3
①
②
③
④
⑤
⑥
⑦
⑧

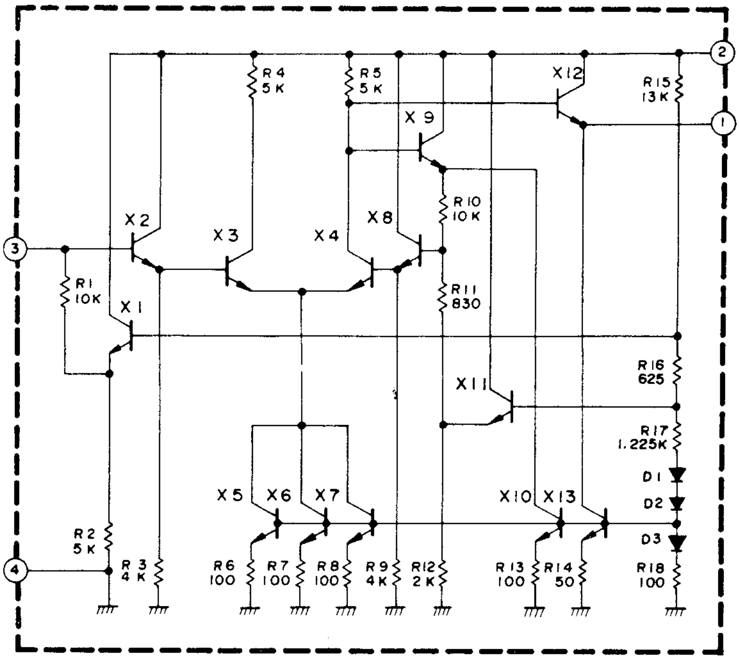

AN262

–AN360 –

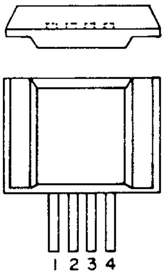

1
2
3
4
5
6
7
T1
T2
T3
D1
R1
R2
R3
R4
R5
R6
R7
R8



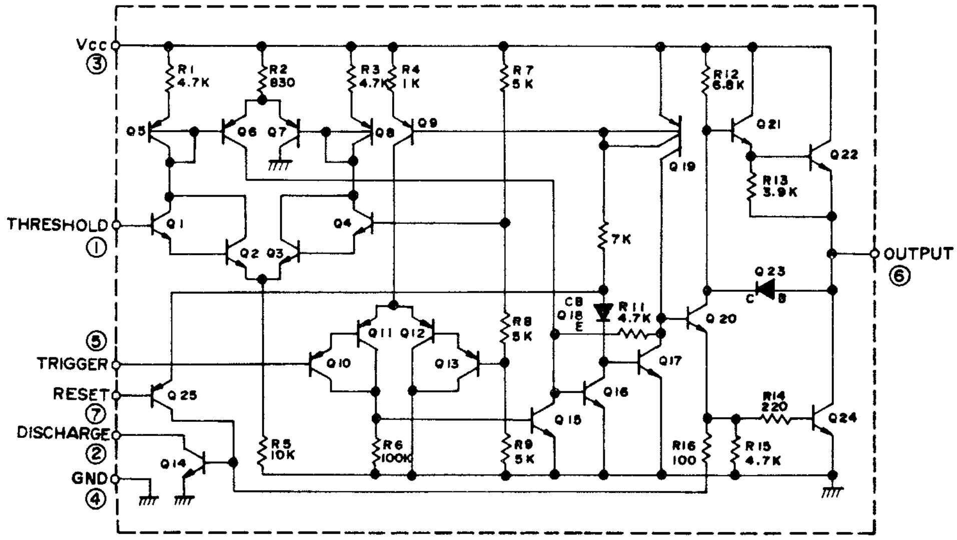
– AN608P –



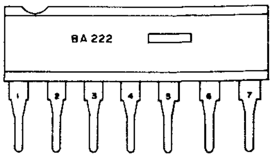
②
①
③
④
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
R1 10K
R2 5K
R3 4K
R4 5K
R5 5K
R6 100
R7 100
R8 100
R9 4K
R10 10K
R11 830
R12 2K
R13 100
R14 50
R15 13K
R16 625
R17 1.225K
R18 100
D1
D2
D3



– BA222 –

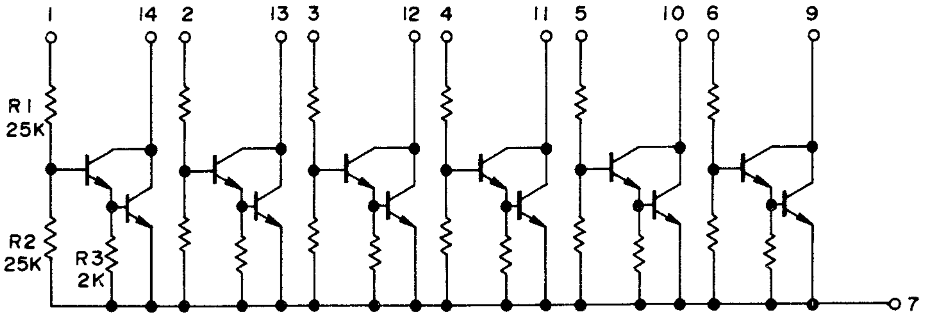


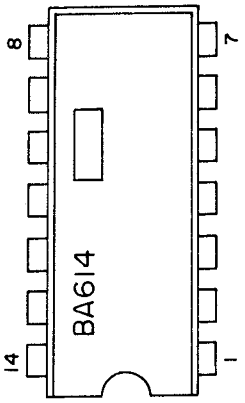
Vcc ③
THRESHOLD ①
⑤ TRIGGER
RESET ⑦
DISCHARGE ②
GND ④
OUTPUT ⑥
R1 4.7K
R2 830
R3 4.7K
R4 1K
R5 10K
R6 100K
R7 5K
R8 5K
R9 5K
R11 4.7K
R12 6.8K
R13 3.9K
R14 220
R15 4.7K
R16 100
7K
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
CB Q18 E
Q19
Q20
Q21
Q22
Q23 C B
Q24
Q25



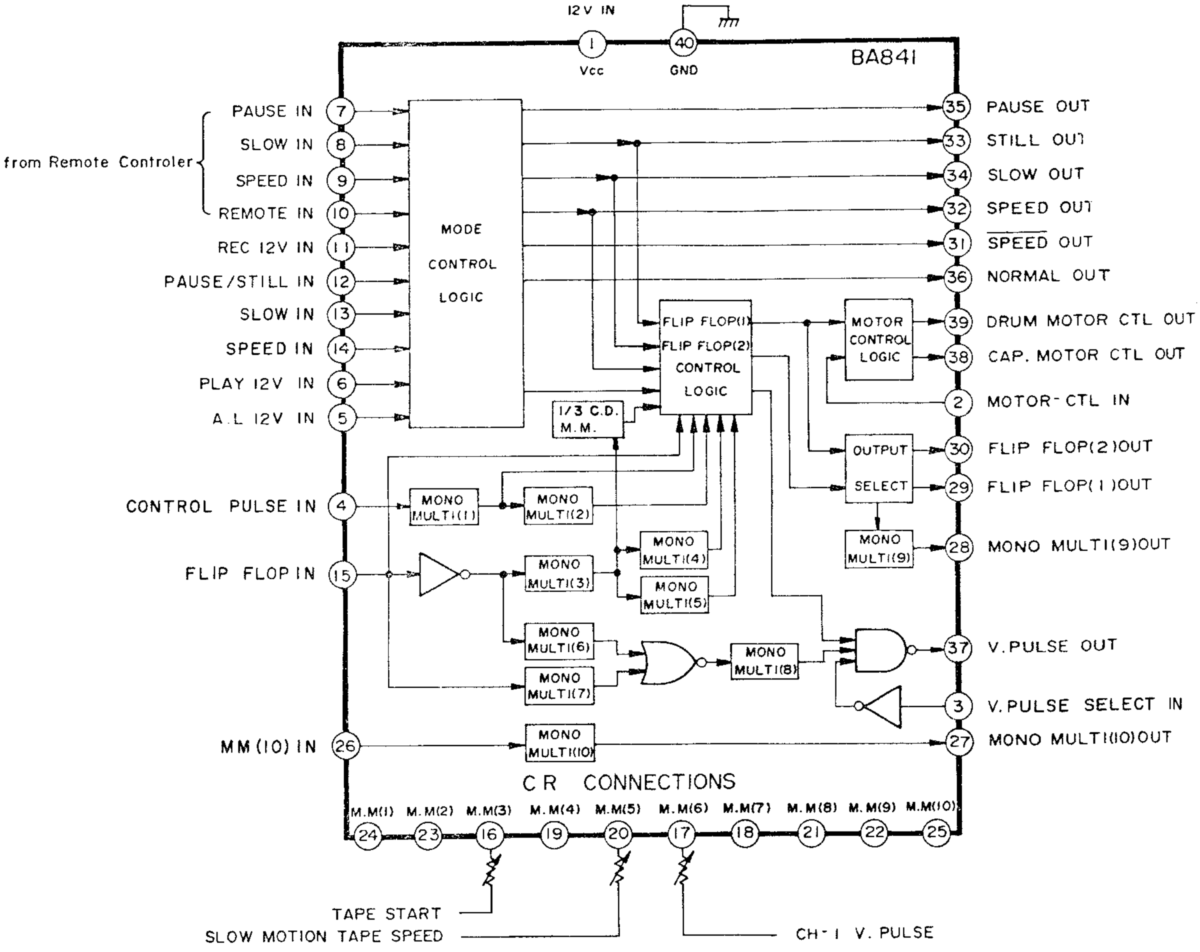
BA 222
1
2
3
4
5
6
7

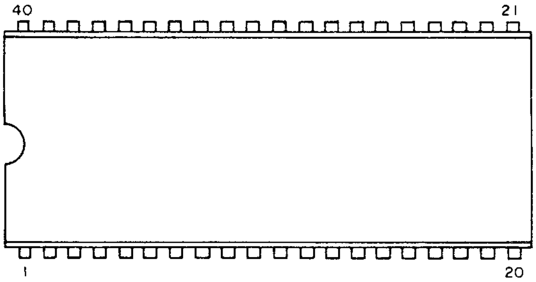
– BA614A –


1
14
2
13
3
12
4
11
5
10
6
9
R1
25K
R2
25K
R3
2K
7

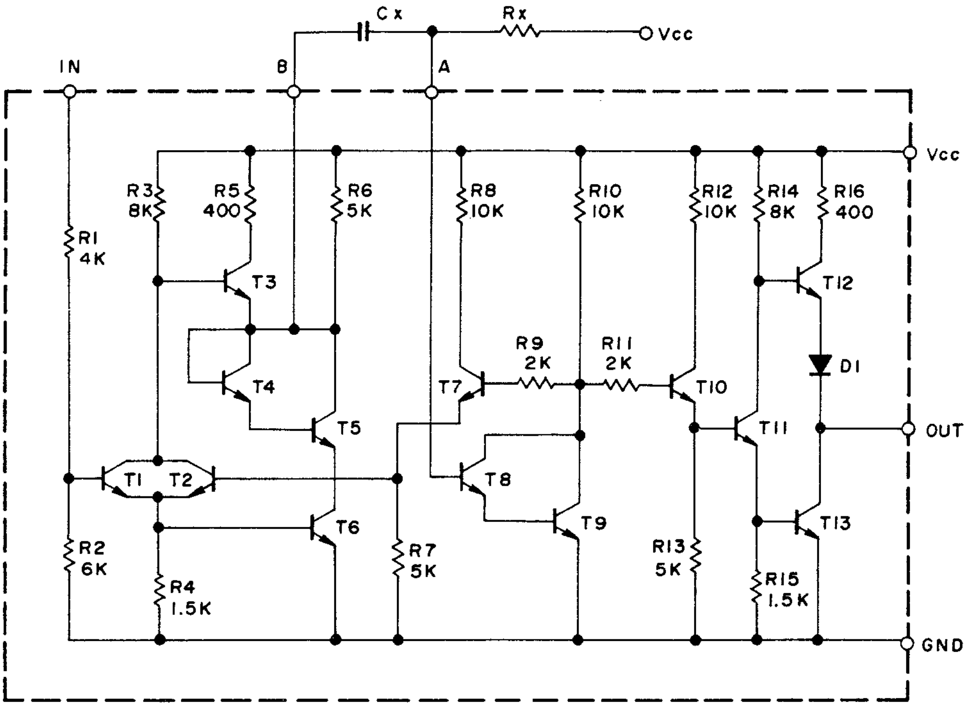

8
7
BA614
14
1

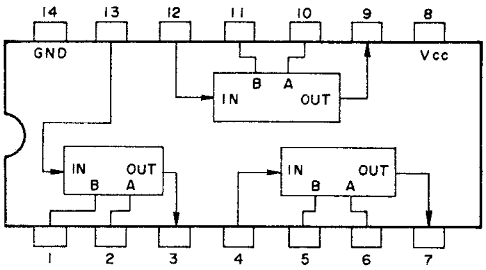
– BA841 –


12V IN
1
40
Vcc
GND
BA841
from Remote Controler
PAUSE IN 7
SLOW IN 8
SPEED IN 9
REMOTE IN 10
REC 12V IN 11
PAUSE/STILL IN 12
SLOW IN 13
SPEED IN 14
PLAY 12V IN 6
A.L 12V IN 5
CONTROL PULSE IN 4
FLIP FLOP IN 15
MM(10) IN 26
MODE CONTROL LOGIC
FLIP FLOP(1)
FLIP FLOP(2)
CONTROL LOGIC
1/3 C.D. M.M.
MOTOR CONTROL LOGIC
OUTPUT SELECT
MONO MULTI(1)
MONO MULTI(2)
MONO MULTI(3)
MONO MULTI(4)
MONO MULTI(5)
MONO MULTI(6)
MONO MULTI(7)
MONO MULTI(8)
MONO MULTI(9)
MONO MULTI(10)
35 PAUSE OUT
33 STILL OUT
34 SLOW OUT
32 SPEED OUT
31 SPEED OUT
36 NORMAL OUT
39 DRUM MOTOR CTL OUT
38 CAP. MOTOR CTL OUT
2 MOTOR-CTL IN
30 FLIP FLOP(2)OUT
29 FLIP FLOP(1)OUT
28 MONO MULTI(9)OUT
37 V.PULSE OUT
3 V.PULSE SELECT IN
27 MONO MULTI(10)OUT
CR CONNECTIONS
M.M(1) 24
M.M(2) 23
M.M(3) 16
M.M(4) 19
M.M(5) 20
M.M(6) 17
M.M(7) 18
M.M(8) 21
M.M(9) 22
M.M(10) 25
TAPE START
SLOW MOTION TAPE SPEED
CH-1 V. PULSE

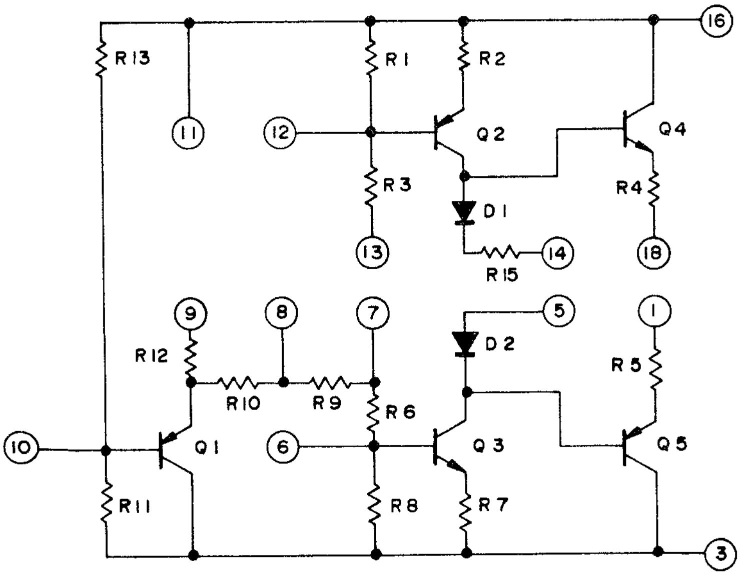


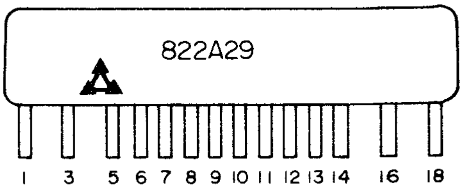
— DN850 —


Cx
Rx
Vcc
IN
B
A
Vcc
R3 8K
R5 400
R6 5K
R8 10K
R10 10K
R12 10K
R14 8K
R16 400
R1 4K
T3
T12
T4
R9 2K
R11 2K
T7
T10
D1
T5
T11
OUT
T1
T2
T8
T6
T9
T13
R2 6K
R7 5K
R13 5K
R4 1.5K
R15 1.5K
GND

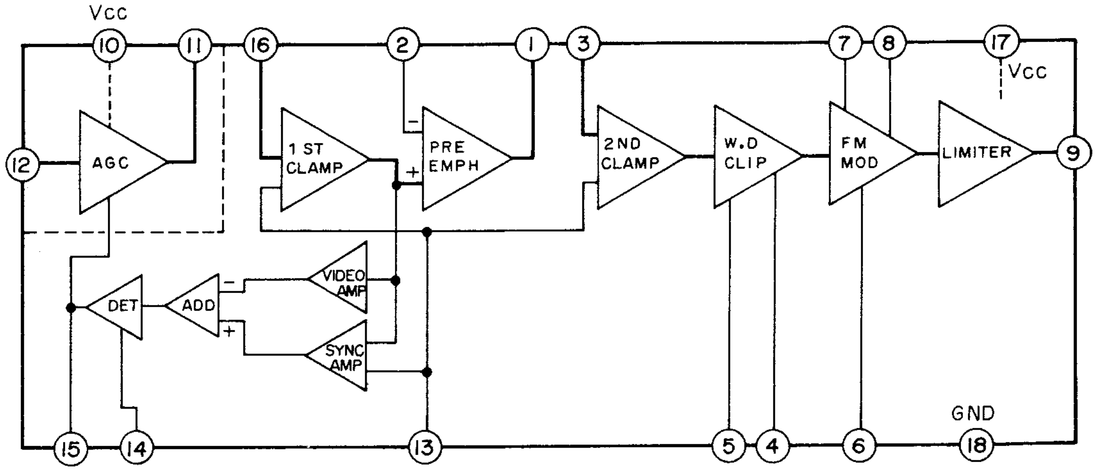

14
13
12
11
10
9
8
GND
Vcc
B
A
IN
OUT
IN
OUT
B
A
IN
OUT
B
A
1
2
3
4
5
6
7

— EHM-822A29 —

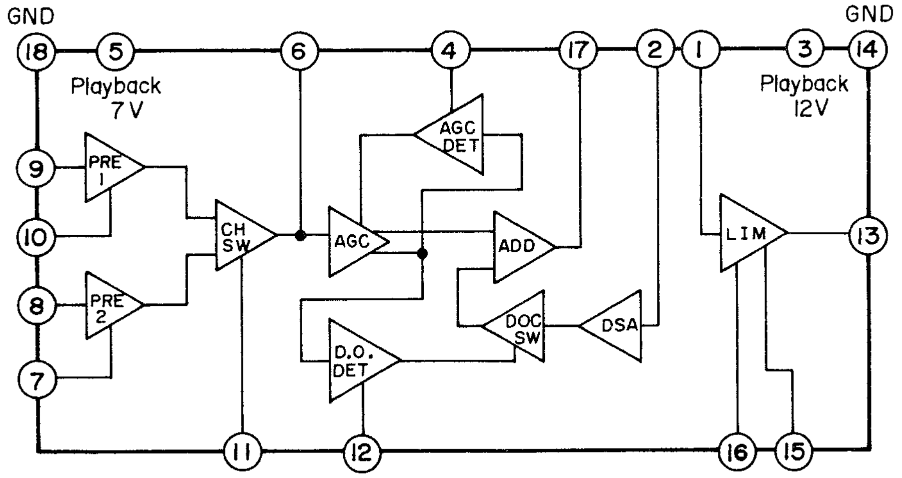

16
R13
R1
R2
11
12
Q2
Q4
R3
R4
D1
13
14
18
R15
9
8
7
5
1
D2
R12
R5
R10
R9
R6
10
Q1
6
Q3
Q5
R11
R8
R7
3


822A29
1
3
5
6
7
8
9
10
11
12
13
14
16
18

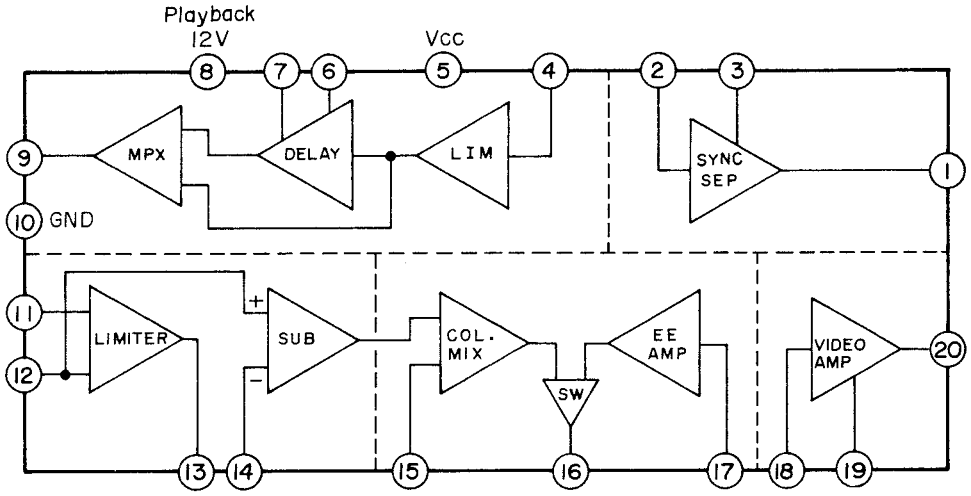
– HA11701 –


Vcc
10
11
16
2
1
3
7
8
17
Vcc
12
AGC
1 ST CLAMP
−
+
PRE EMPH
2ND CLAMP
W.D CLIP
FM MOD
LIMITER
9
DET
ADD
−
+
VIDEO AMP
SYNC AMP
GND
15
14
13
5
4
6
18

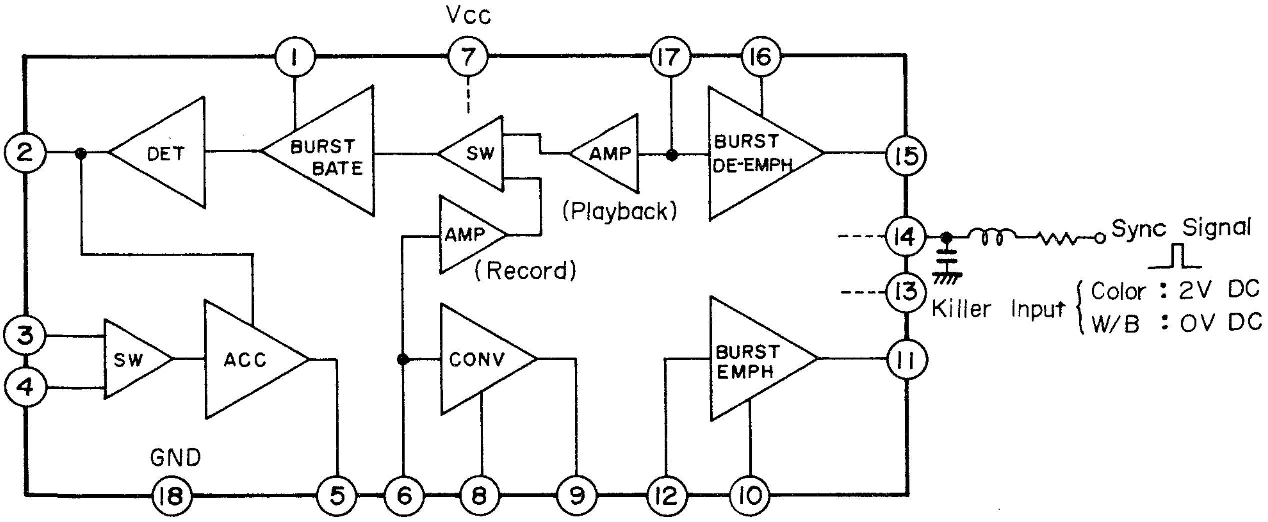
– HA11702 –


GND
18
5
6
4
17
2
1
3
14
GND
Playback 7V
Playback 12V
9
PRE 1
10
8
PRE 2
7
CH SW
AGC
AGC DET
ADD
DOC SW
DSA
D.O. DET
LIM
13
11
12
16
15

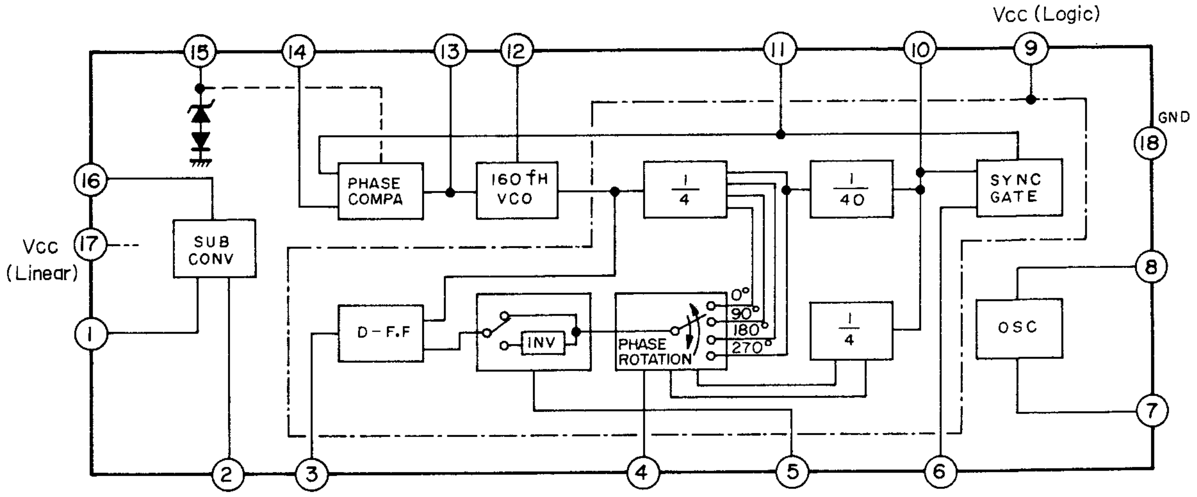
– HA11703 –


Playback 12V
Vcc
8
7
6
5
4
2
3
9
MPX
DELAY
LIM
SYNC SEP
1
10
GND
11
12
LIMITER
+
−
SUB
COL. MIX
SW
EE AMP
VIDEO AMP
20
13
14
15
16
17
18
19

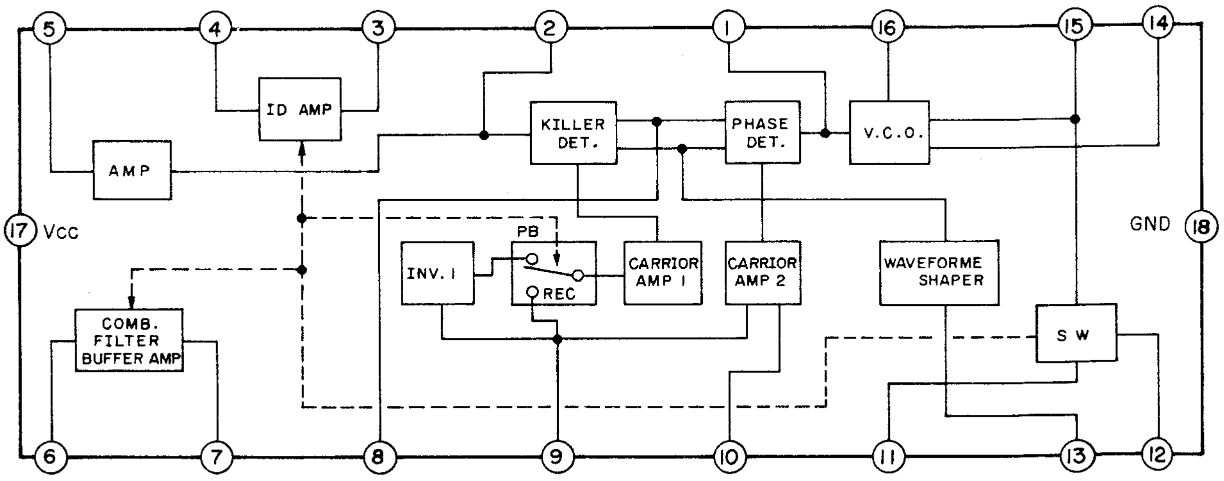
– HA11704 –


Vcc
1
7
17
16
2
DET
BURST BATE
SW
AMP
(Playback)
BURST DE-EMPH
15
AMP
(Record)
14
Sync Signal
13
Killer Input
Color : 2V DC
W/B : 0V DC
3
4
SW
ACC
CONV
BURST EMPH
11
GND
18
5
6
8
9
12
10

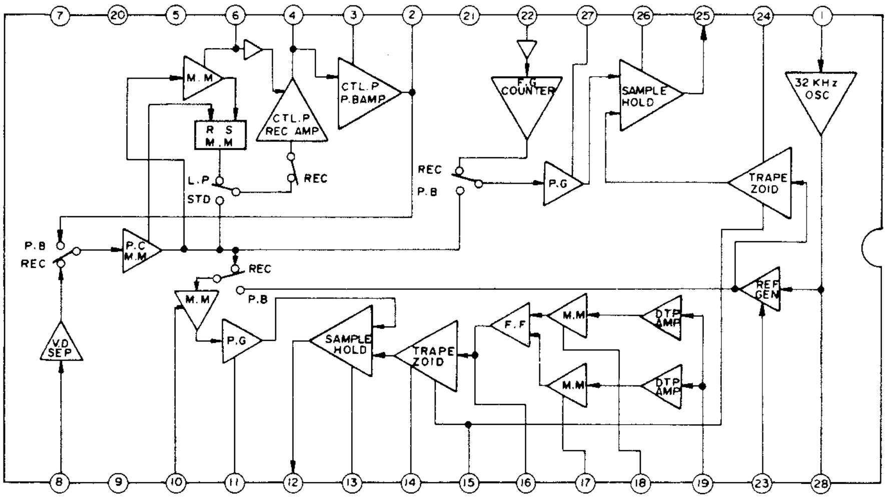
– HA11705 –

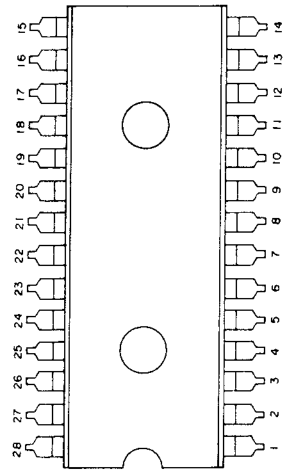

Vcc (Logic)
15
14
13
12
11
10
9
GND
18
16
17
Vcc
(Linear)
1
PHASE COMPA
160 fH VCO
1/4
1/40
SYNC GATE
SUB CONV
D-F.F
INV
PHASE ROTATION
0°
90°
180°
270°
1/4
OSC
8
7
2
3
4
5
6

– HA11706 –

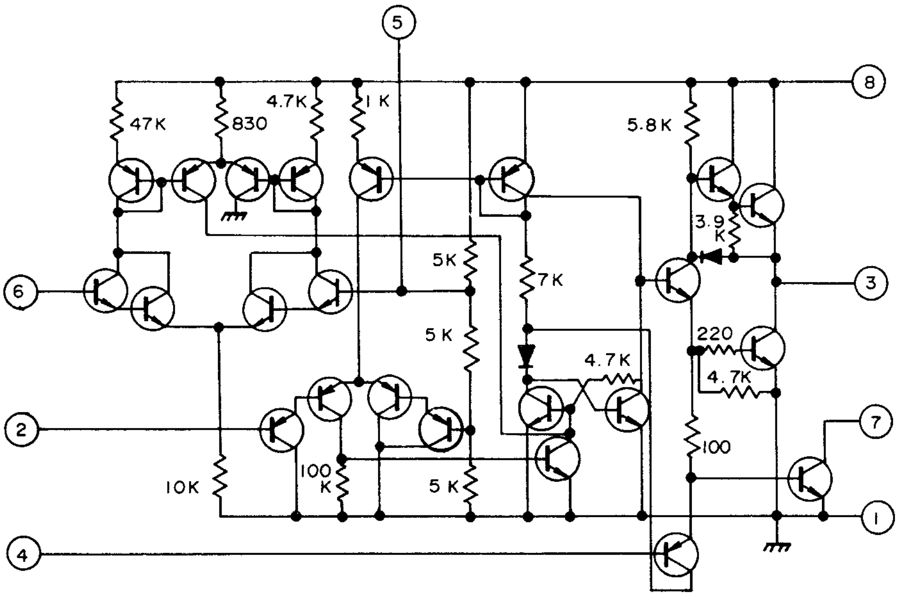

5
4
3
2
1
16
15
14
ID AMP
KILLER DET.
PHASE DET.
V.C.O.
AMP
17 Vcc
GND 18
PB
INV. I
REC
CARRIOR AMP I
CARRIOR AMP 2
WAVEFORME SHAPER
COMB. FILTER BUFFER AMP
S W
6
7
8
9
10
11
13
12

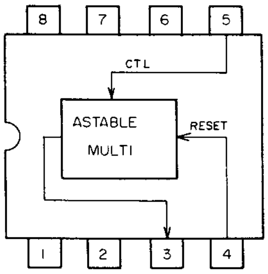
– HA11711 –

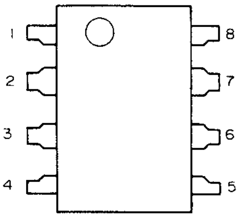

7
20
5
6
4
3
2
21
22
27
26
25
24
1
M.M
CTL.P REC AMP
CTL.P P.BAMP
R S M.M
F.G COUNTER
SAMPLE HOLD
32 KHz OSC
L.P
STD
REC
P.B
P.G
TRAPE ZOID
P.B
REC
P.C M.M
REC
M.M
P.B
REF GEN
V.D SEP
P.G
SAMPLE HOLD
TRAPE ZOID
F.F
M.M
DTP AMP
M.M
DTP AMP
8
9
10
11
12
13
14
15
16
17
18
19
23
28


15
16
17
18
19
20
21
22
23
24
25
26
27
28
14
13
12
11
10
9
8
7
6
5
4
3
2
1

– HA17555PS –

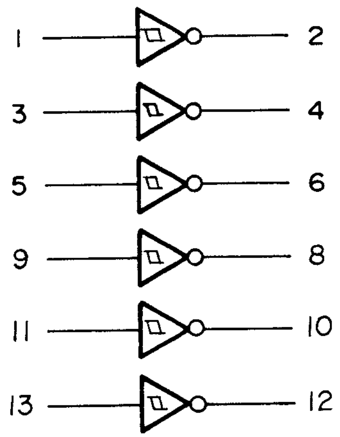

5
8
47K
830
4.7K
1 K
5.8K
3.9 K
6
5K
7K
3
5 K
220
4.7K
4.7K
2
100
7
100 K
10K
5 K
1
4


8
7
6
5
CTL
ASTABLE MULTI
RESET
1
2
3
4



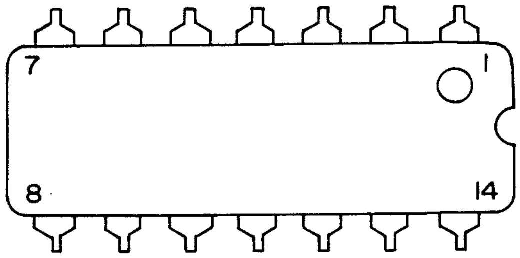
– MC14584B –

LOGIC DIAGRAM

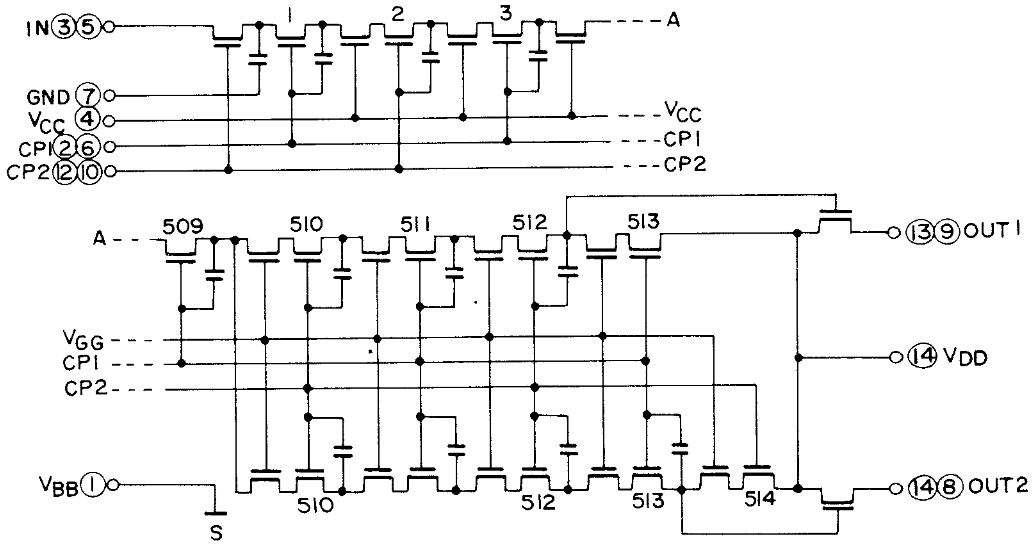

1
2
3
4
5
6
9
8
11
10
13
12

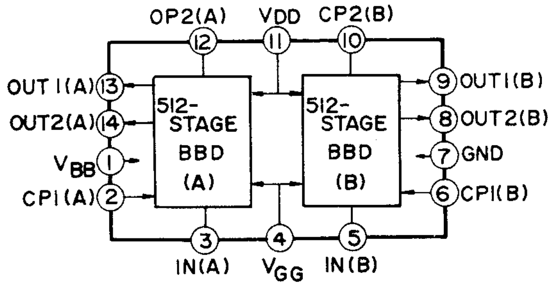
V_{DD} = Pin 14

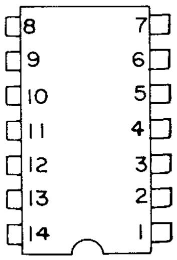
Vss = Pin 7



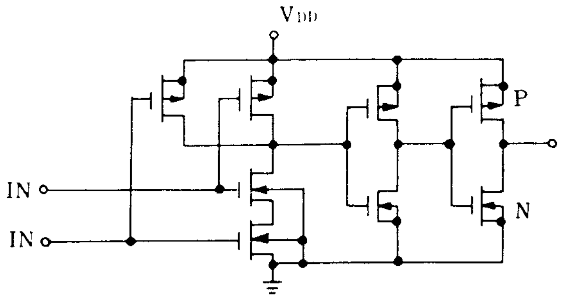
– MN3001 –

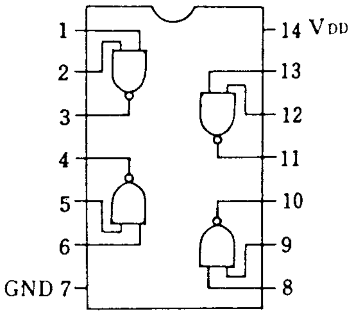

IN③⑤
1
2
3
A
GND ⑦
VCC ④
CP1②⑥
CP2⑫⑩
VCC
CP1
CP2
A
509
510
511
512
513
⑬⑨ OUT 1
VGG
CP1
CP2
⑭ VDD
VBB①
S
510
512
513
514
⑭⑧ OUT2


OP2(A)
VDD
CP2(B)
12
11
10
OUT 1(A) 13
OUT2(A) 14
VBB 1
CP1(A) 2
512-STAGE BBD (A)
512-STAGE BBD (B)
9 OUT1(B)
8 OUT2(B)
7 GND
6 CP1(B)
3
4
5
IN(A)
VGG
IN(B)

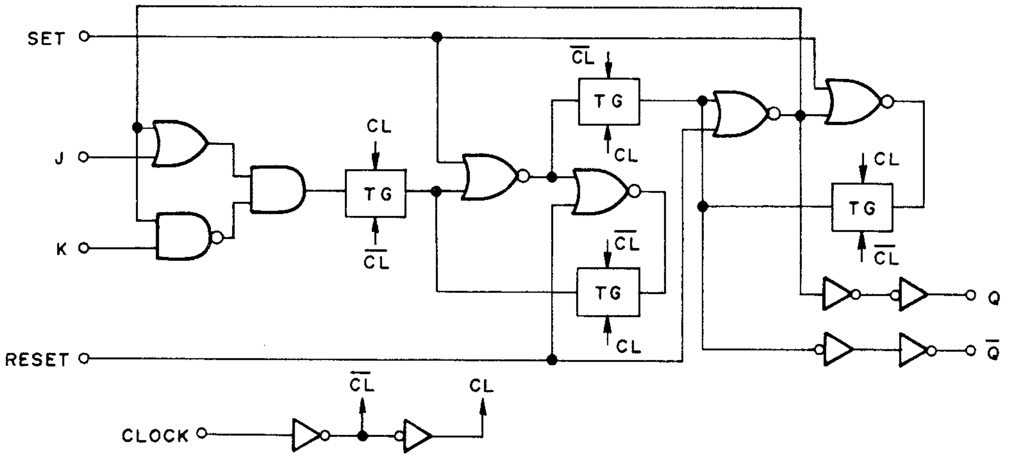

8
9
10
11
12
13
14
7
6
5
4
3
2
1

— MSM4011 —

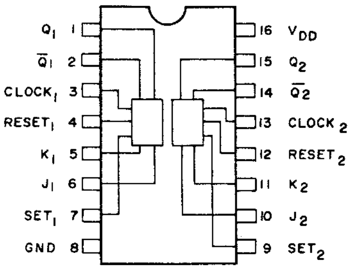



1
2
3
4
5
6
GND 7
14 VDD
13
12
11
10
9
8

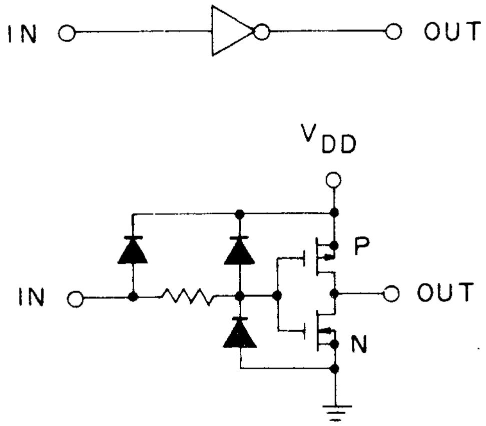
— MSM4027 —

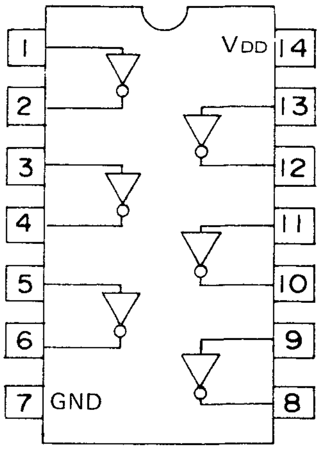

SET
J
K
RESET
CLOCK
TG
TG
TG
TG
CL
$\overline{CL}$
Q
$\overline{Q}$

16 Lead Dip (Resin Type) Top View

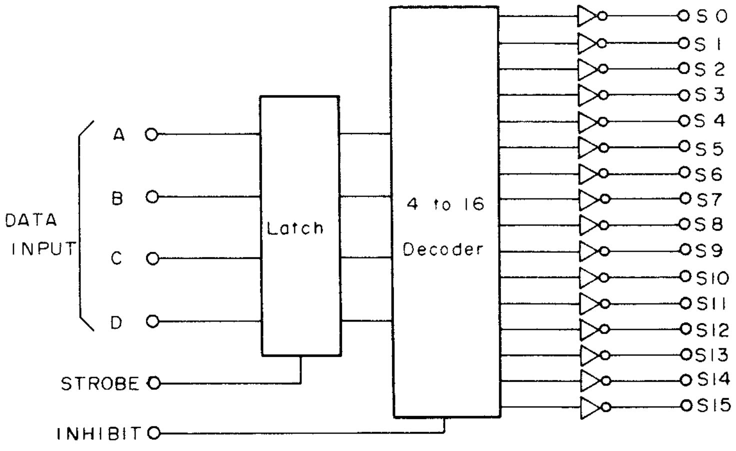

Q_1 1
$\overline{Q}_1$ 2
$CLOCK_1$ 3
$RESET_1$ 4
K_1 5
J_1 6
SET_1 7
GND 8
16 V_{DD}
15 Q_2
14 $\overline{Q}_2$
13 $CLOCK_2$
12 $RESET_2$
11 K_2
10 J_2
9 SET_2

– MSM4069(UBRU) –

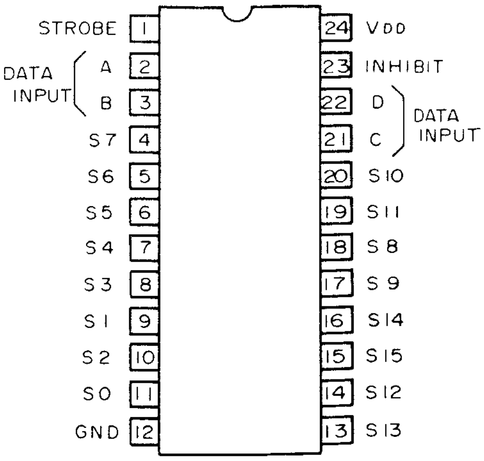

IN
OUT
VDD
P
IN
OUT
N

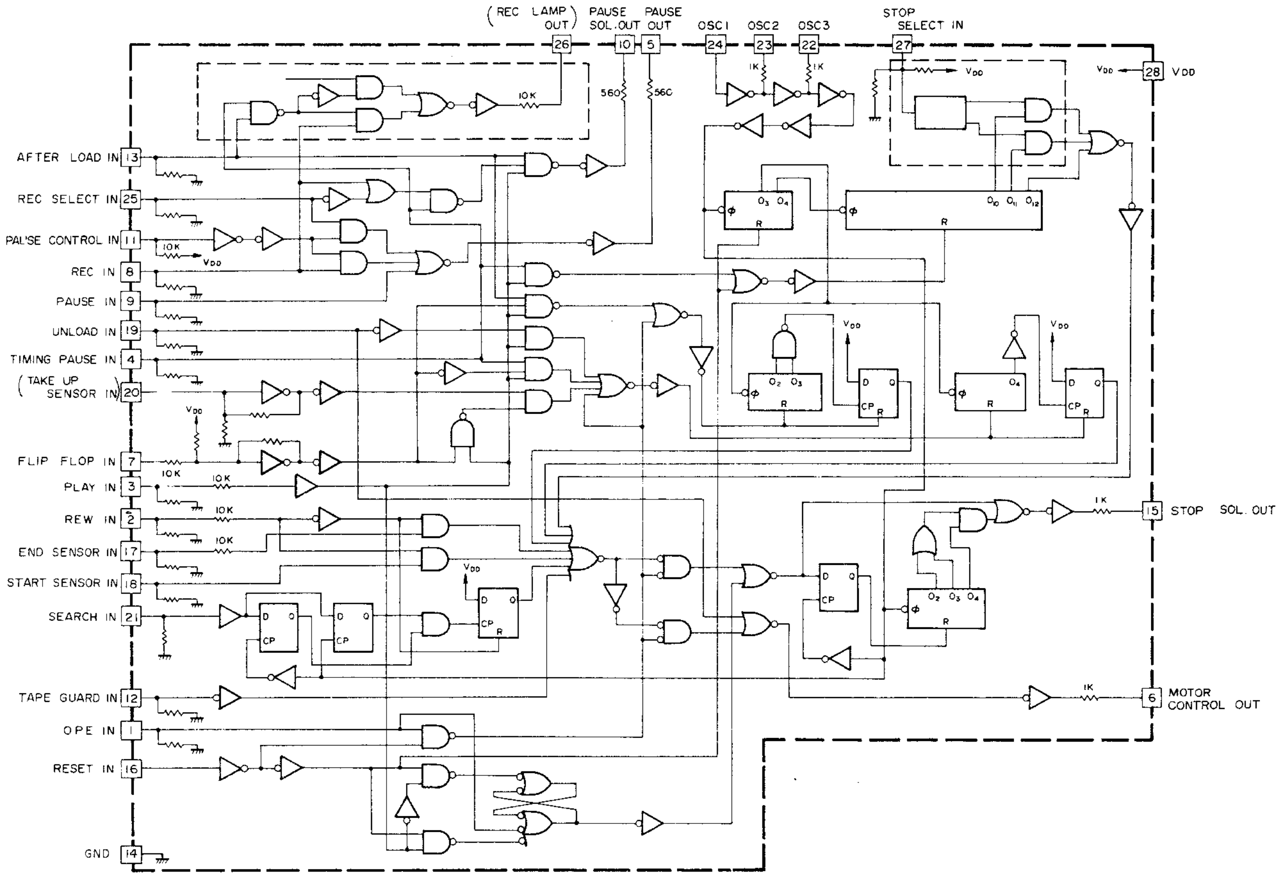

1
2
3
4
5
6
7 GND
VDD 14
13
12
11
10
9
8

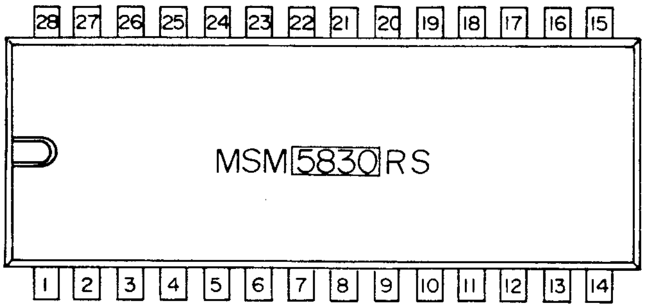
– MSM4514 –


DATA INPUT
A
B
C
D
STROBE
INHIBIT
Latch
4 to 16 Decoder
S 0
S 1
S 2
S 3
S 4
S 5
S 6
S 7
S 8
S 9
S 10
S 11
S 12
S 13
S 14
S 15

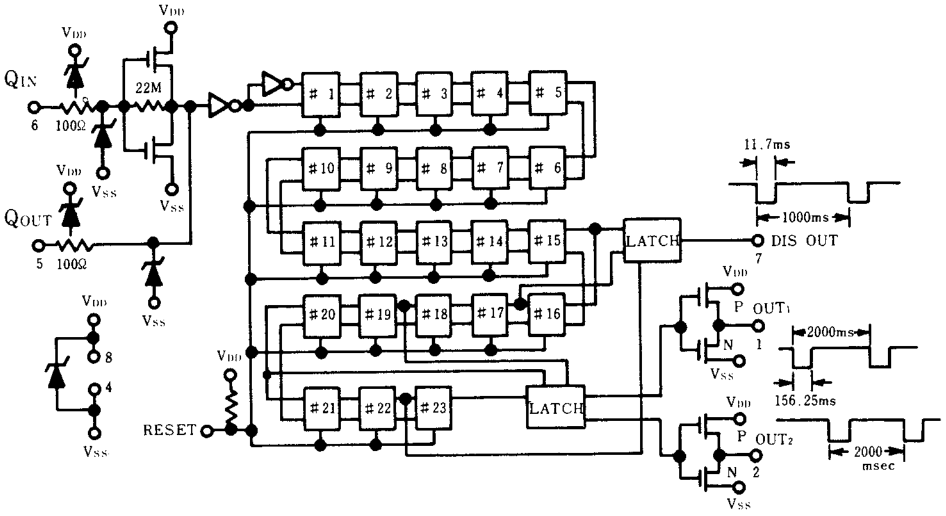
(Top View) 24 Lead Plastic DIP

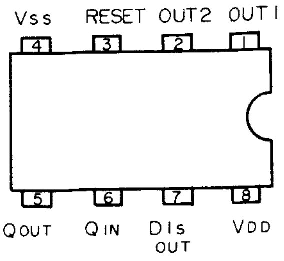

STROBE 1
DATA INPUT
A 2
B 3
S 7 4
S 6 5
S 5 6
S 4 7
S 3 8
S 1 9
S 2 10
S 0 11
GND 12
24 VDD
23 INHIBIT
22 D
21 C
DATA INPUT
20 S 10
19 S 11
18 S 8
17 S 9
16 S 14
15 S 15
14 S 12
13 S 13


(REC LAMP OUT) 26
PAUSE SOL.OUT 10
PAUSE OUT 5
OSC1 24
OSC2 23
OSC3 22
STOP SELECT IN 27
VDD 28
AFTER LOAD IN 13
REC SELECT IN 25
PAUSE CONTROL IN 11
REC IN 8
PAUSE IN 9
UNLOAD IN 19
TIMING PAUSE IN 4
(TAKE UP SENSOR IN) 20
FLIP FLOP IN 7
PLAY IN 3
REW IN 2
END SENSOR IN 17
START SENSOR IN 18
SEARCH IN 21
TAPE GUARD IN 12
OPE IN 1
RESET IN 16
GND 14
STOP SOL. OUT 15
MOTOR CONTROL OUT 6
10K
1K
560
VDD
D Q CP R
ϕ O_3 O_4 R
ϕ O_{10} O_{11} O_{12} R
ϕ O_2 O_3 R
ϕ O_4 R
ϕ O_2 O_3 O_4 R

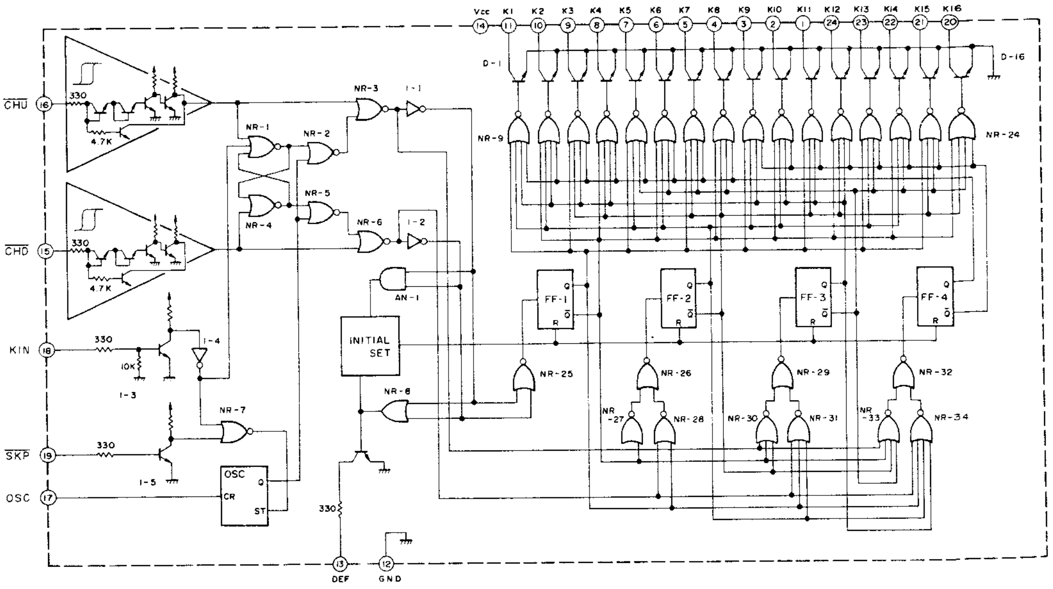

28 27 26 25 24 23 22 21 20 19 18 17 16 15
MSM5830RS
1 2 3 4 5 6 7 8 9 10 11 12 13 14

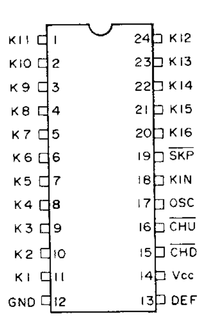
– SM5502A –


QIN
6
100Ω
VDD
VSS
22M
QOUT
5
100Ω
8
4
RESET
#1
#2
#3
#4
#5
#10
#9
#8
#7
#6
#11
#12
#13
#14
#15
#20
#19
#18
#17
#16
#21
#22
#23
LATCH
LATCH
11.7ms
1000ms
DIS OUT
7
P OUT1
N 1
2000ms
156.25ms
P OUT2
N 2
2000 msec

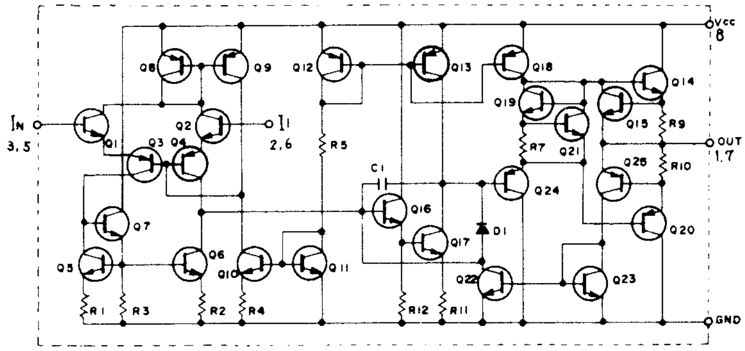

Vss
RESET
OUT2
OUT1
4
3
2
1
5
6
7
8
QOUT
QIN
DIS OUT
VDD

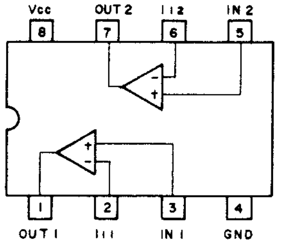
– UPC1363C –

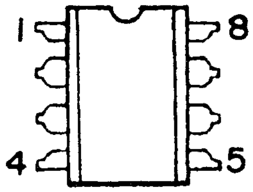

Vcc
K1
K2
K3
K4
K5
K6
K7
K8
K9
K10
K11
K12
K13
K14
K15
K16
D-1
D-16
NR-9
NR-24
CHU
CHD
KIN
SKP
OSC
330
4.7K
10K
NR-1
NR-2
NR-3
NR-4
NR-5
NR-6
NR-7
NR-8
I-1
I-2
I-3
I-4
I-5
AN-1
INITIAL SET
OSC
CR
Q
ST
FF-1
FF-2
FF-3
FF-4
NR-25
NR-26
NR-27
NR-28
NR-29
NR-30
NR-31
NR-32
NR-33
NR-34
DEF
GND


K11 1
K10 2
K9 3
K8 4
K7 5
K6 6
K5 7
K4 8
K3 9
K2 10
K1 11
GND 12
24 K12
23 K13
22 K14
21 K15
20 K16
19 SKP
18 KIN
17 OSC
16 CHU
15 CHD
14 Vcc
13 DEF

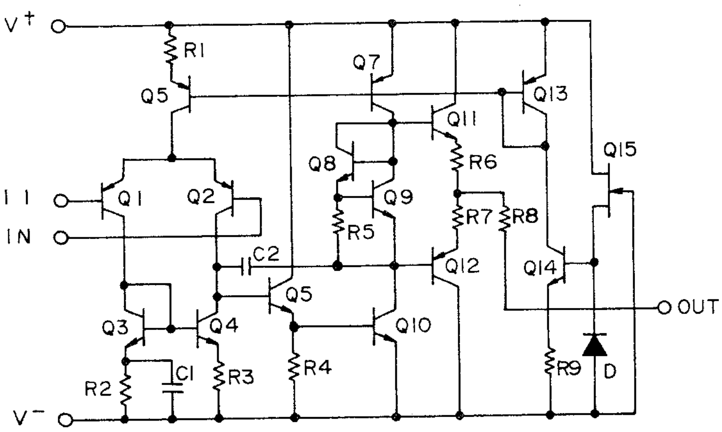
– UPC1458C –

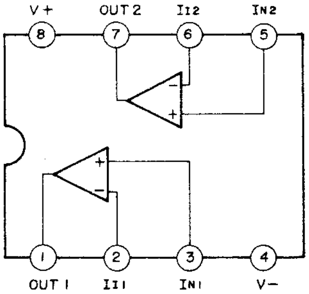

Vcc
8
IN
3.5
I1
2.6
OUT
1.7
GND
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
R1
R2
R3
R4
R5
R7
R9
R10
R11
R12
C1
D1


Vcc
OUT 2
I12
IN 2
8
7
6
5
1
2
3
4
OUT 1
I11
IN 1
GND

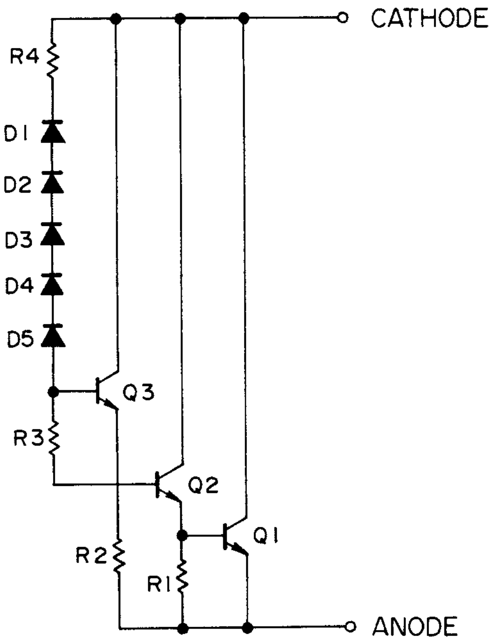


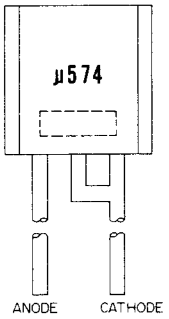
– UPC4558C –


V+
V−
I1
IN
OUT
Q1
Q2
Q3
Q4
Q5
Q5
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
R1
R2
R3
R4
R5
R6
R7
R8
R9
C1
C2
D

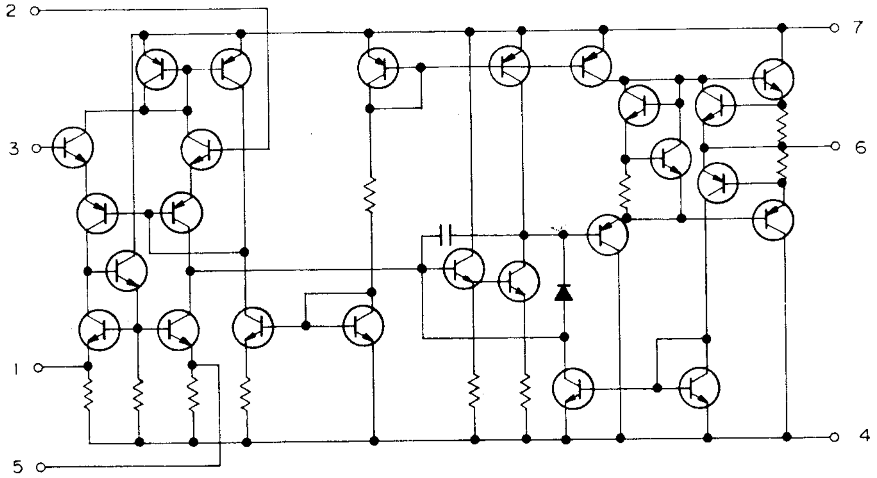

V+
OUT 2
II2
IN2
8
7
6
5
1
2
3
4
OUT 1
II1
IN1
V−

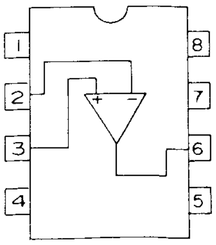
– UPC574J –


CATHODE
R4
D1
D2
D3
D4
D5
Q3
R3
Q2
Q1
R2
R1
ANODE

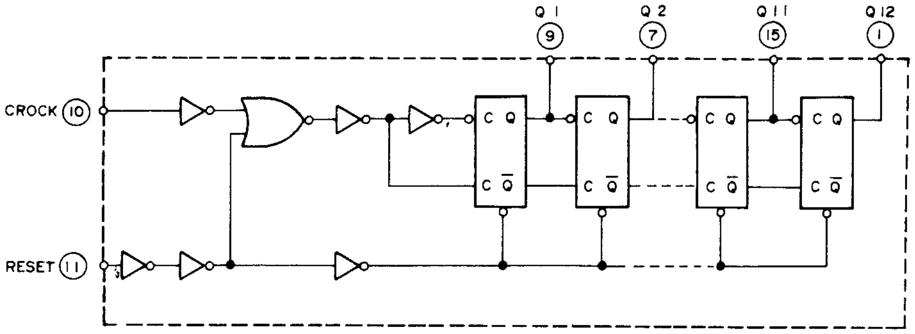

µ574
ANODE
CATHODE

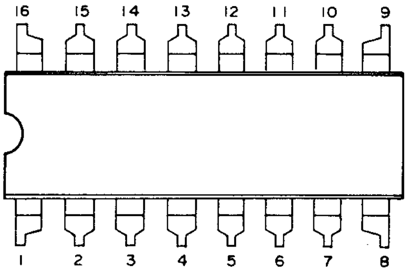
– UPC741C –



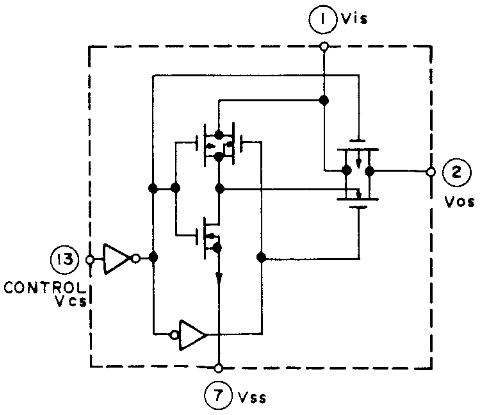


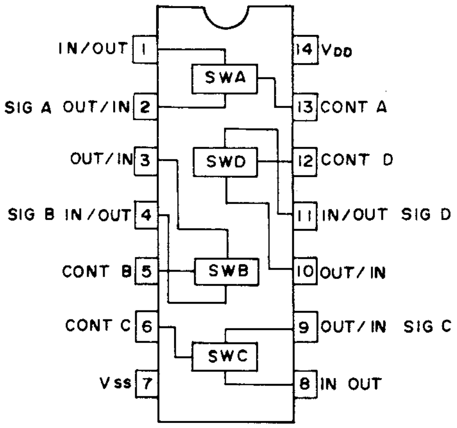
– UPD4040C –


Q 1
9
Q 2
7
Q 11
15
Q 12
1
CROCK
10
RESET
11
C Q
C Q̄

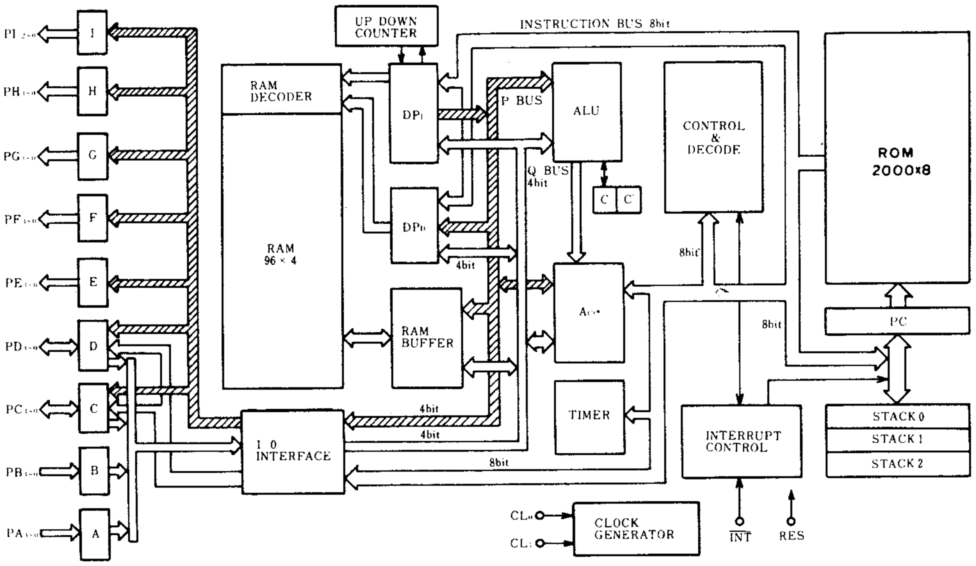

16
15
14
13
12
11
10
9
1
2
3
4
5
6
7
8

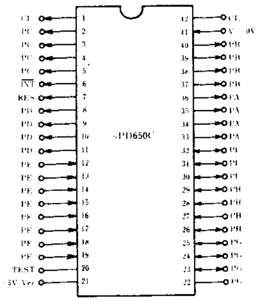
– UPD4066C –


1
Vis
2
Vos
13
CONTROL
Vcs
7
Vss

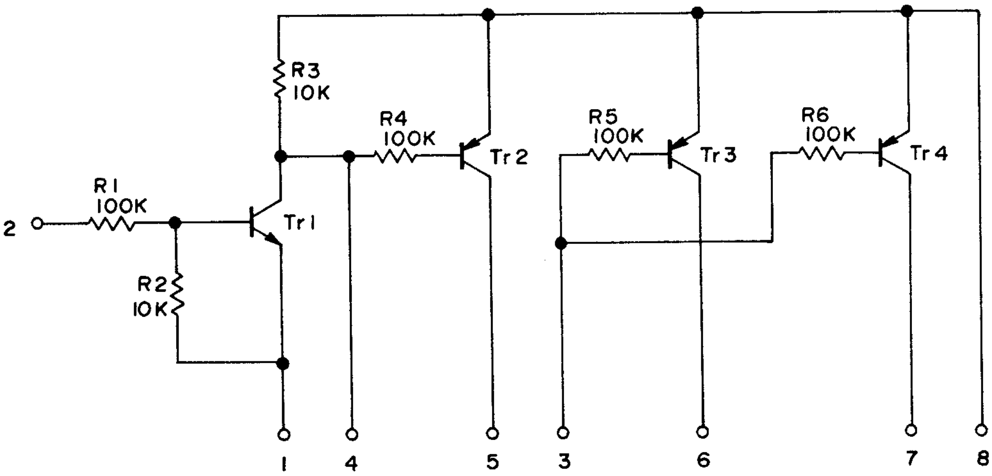

IN/OUT 1
SIG A OUT/IN 2
OUT/IN 3
SIG B IN/OUT 4
CONT B 5
CONT C 6
Vss 7
14 VDD
13 CONT A
12 CONT D
11 IN/OUT SIG D
10 OUT/IN
9 OUT/IN SIG C
8 IN OUT
SWA
SWD
SWB
SWC

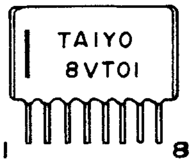
– UPD650C-024 –


PI
PH
PG
PF
PE
PD
PC
PB
PA
I
H
G
F
E
D
C
B
A
UP DOWN COUNTER
INSTRUCTION BUS 8bit
RAM DECODER
RAM 96 × 4
DPL
DPH
RAM BUFFER
P BUS
Q BUS 4bit
ALU
C
C
Acc
TIMER
CONTROL & DECODE
ROM 2000×8
PC
STACK 0
STACK 1
STACK 2
INTERRUPT CONTROL
I O INTERFACE
4bit
8bit
CLOCK GENERATOR
CL0
CL1
INT
RES

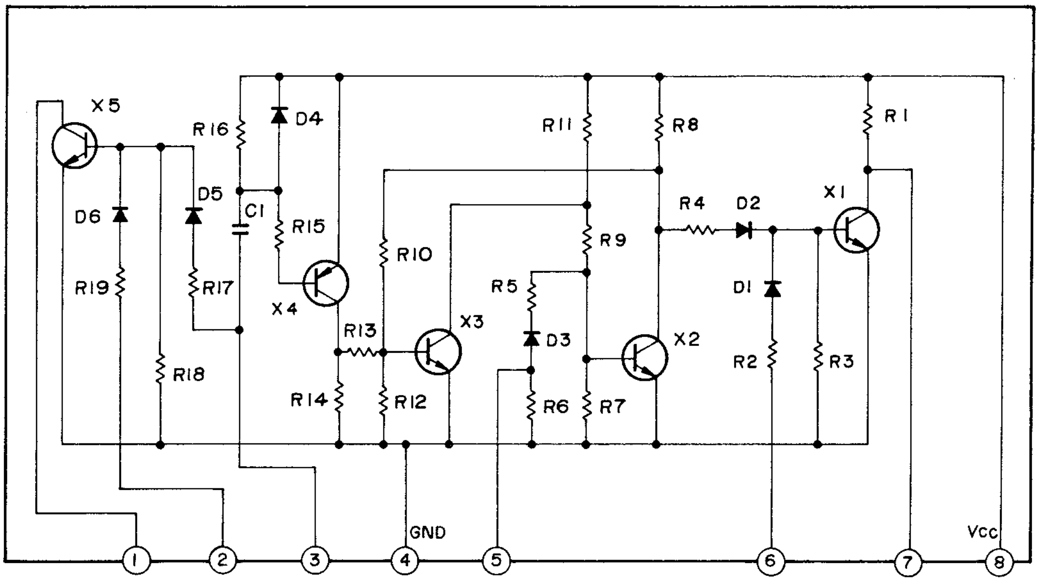

μPD650C
CL
PC
INT
RES
PD
PE
PF
TEST
+5V Vcc
V 0V
PB
PA
PI
PH
PG

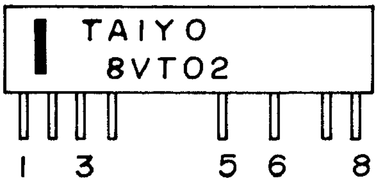
– 8VT01 –


R1 100K
R2 10K
R3 10K
R4 100K
R5 100K
R6 100K
Tr1
Tr2
Tr3
Tr4
2
1
4
5
3
6
7
8

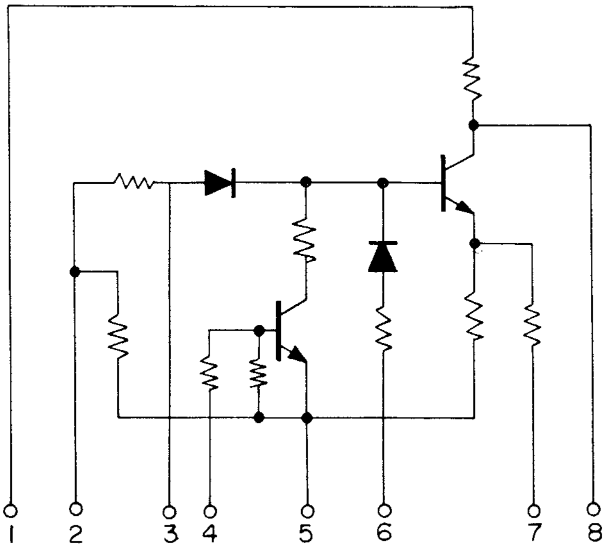

TAIYO
8VT01
1
8

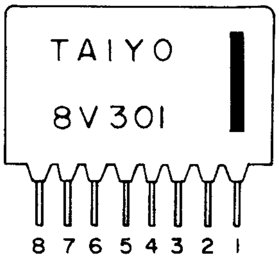
– 8VT02 –


X5
R16
D4
R11
R8
R1
D6
D5
C1
R15
R4
D2
X1
R19
R17
R10
R9
X4
R5
D1
R13
X3
D3
X2
R18
R2
R3
R14
R12
R6
R7
GND
Vcc
1
2
3
4
5
6
7
8

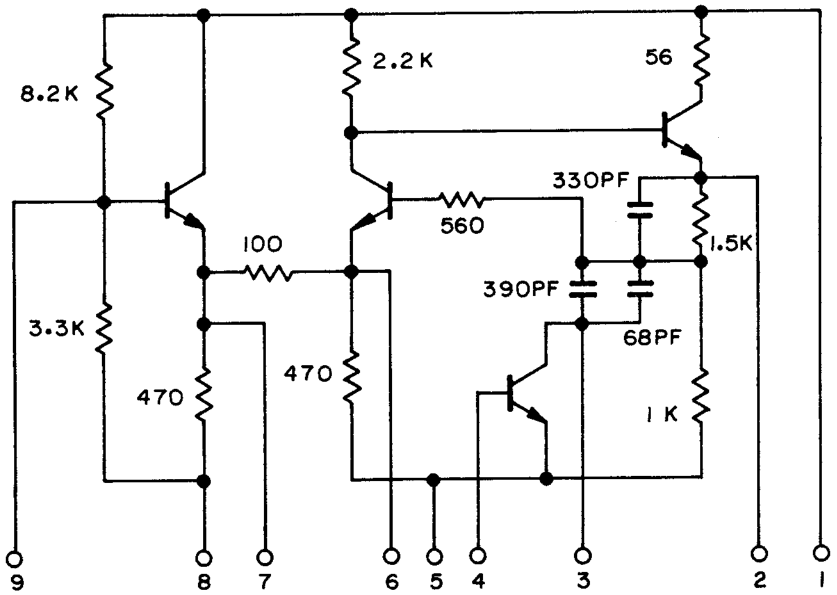

TAIYO
8VT02

– 8V301 –

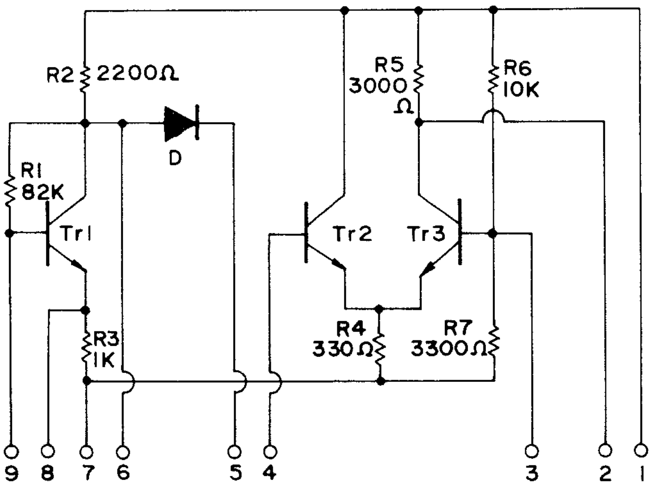


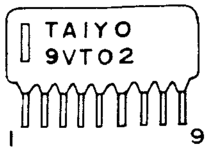

TAIYO
8V301
8 7 6 5 4 3 2 1

– 9VT01 –

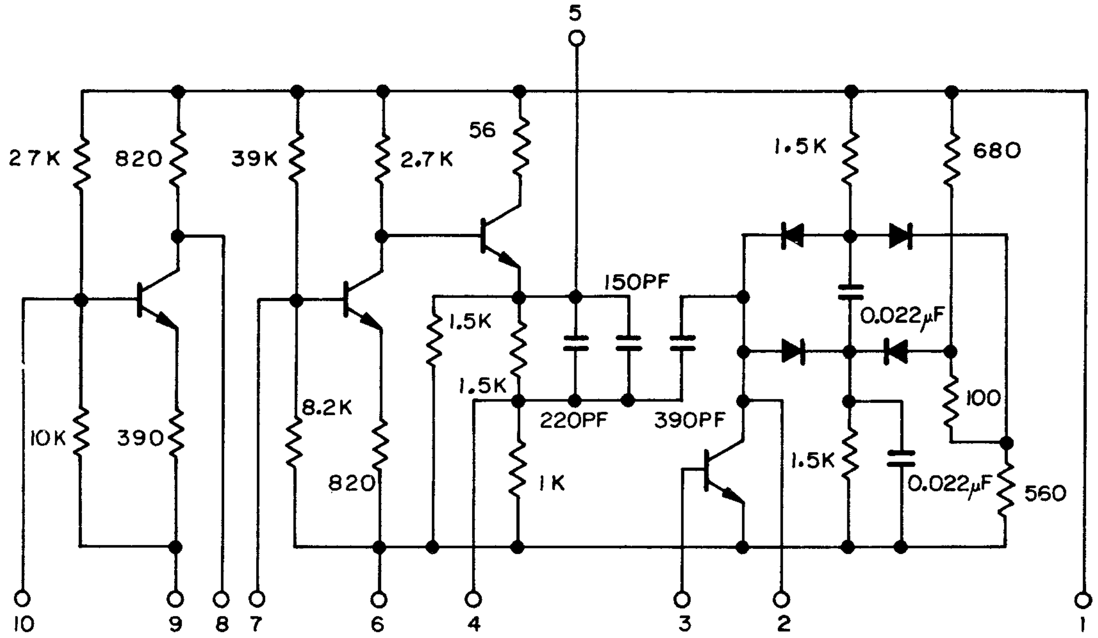

8.2K
3.3K
2.2K
330PF
1.5K
390PF
68PF
1K

– 9VT02 –


R2 2200Ω
D
R1
82K
Tr1
R3
1K
R5
3000
Ω
R6
10K
Tr2
Tr3
R4
330Ω
R7
3300Ω
9
8
7
6
5
4
3
2
1


TAIYO
9VT02
1
9

– 10VT01 –


5
27K
820
39K
2.7K
56
1.5K
680
150PF
1.5K
0.022μF
1.5K
100
8.2K
220PF
390PF
10K
390
1.5K
820
1K
0.022μF
560
10
9
8
7
6
4
3
2
1

SECTION 9
ELECTRICAL PARTS LIST

1. SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

2. Abbreviations in this list are as follows:

RESISTORS – All resistance values are in ohms (Ω).

K	:	1 000
M	:	1 000 000
CR	:	Carbon Resistor
Comp. R	:	Composition Resistor
WR	:	Wire Wound Resistor
OMR	:	Oxide Metal Film Resistor
VR	:	Variable Resistor (Potentiometer)
MFR	:	Metal Film Resistor
FR	:	Fusible Resistor

CAPACITORS – All capacitance values are in μF, unless otherwise indicated.

P	:	μμF
C Cap	:	Ceramic Capacitor
E Cap	:	Electrolytic Capacitor
FM Cap	:	Film Mica Capacitor
MM Cap	:	Metalized Mylar Capacitor
MP Cap	:	Metalized Paper Capacitor
MY Cap	:	Mylar Capacitor
NP Cap	:	Non-polar Capacitor
PC Cap	:	Polycarbonate Capacitor
PP Cap	:	Poly Pro Capacitor
PS Cap	:	Polystyrol Capacitor
T Cap	:	Tantalum Capacitor
TR Cap	:	Trimmer Capacitor

Tolerances of resistors or capacitors are as follows:

M	:	± 20%
K	:	± 10%
J	:	± 5%
G	:	± 2%
F	:	± 1%

9.1 REGULATOR CIRCUIT BOARD ASS'Y

0 1 PU48243A

Symbol No.	Part No.	Part Name	Description
IC 1	MSM4027	Integrated Circuit	or UPD4027C
X 1	2SD639R	Transistor	or 2SD639S
X 2	"	"	"
X 3	2SD637R	"	
X 4	2SC2647C	"	
X 5	"	"	
X 6	2SD639R	"	or 2SD639S
X 7	2SB644R	"	
X 8	2SD639R	"	or 2SD639S
X 9	"	"	"
D 1	MA150	Diode	
D 2	RD6.8EM	Zener Diode	
D 3	–	–	
D 4	OA91	Diode	
D 5	MA150	"	
D 6	RD12EC	Zener Diode	
D 7	VO3C	Diode	
D 8	"	"	
D 9	"	"	
D10	"	"	
D11	–	–	
D12	–	–	
D13	1S2076A	Diode	
D14	"	"	
R 1	–	–	
R 2	–	–	
R 3	QRD187J-223	CR	22 K 1/8 W, J
R 4	" -103	"	10 K " "
R 5	" -222	"	2.2 K " "
R 6	" -222	"	2.2 K " "
⚠ R 7	QRW125J-R47M	WR	0.47 1/2 W, J
⚠ R 8	" -R47M	"	0.47 " "
R 9	QRD187J-821	CR	820 1/8 W, J
R10	" -102	"	1 K " "
R11	QVP4A0B-102	VR	1 K
R12	QRD187J-222	CR	2.2 K 1/8 W, J
R13	" -562	"	5.6 K " "
R14	" -332	"	3.3 K " "
R15	" -562	"	5.6 K " "
R16	" -222	"	2.2 K " "
R17	" -332	"	3.3 K " "
R18	" -331	"	330 " "
R19	" -221	"	220 " "
R20	" -562	"	5.6 K " "
R21	" -103	"	10 K " "
R22	" -104	"	100 K " "
R23	" -103	"	10 K " "
R24	" -272	"	2.7 K " "
R25	" -273	"	27 K " "
R26	" -103	"	10 K " "
R27	" -152	"	1.5 K " "
⚠ R28	QRG129J-471M	OMR	470 1/2 W, J

Symbol No.	Part No.	Part Name	Description
R29	–	–	
⚠ R30	QRG026J-152M	OMR	1.5 K 2 W, J
⚠ R31	" -152M	"	1.5 K " "
⚠ R32	" -152M	"	1.5 K " "
⚠ R33	QRG129J-680M	"	68 1/2 W, J
R34	QRD187J-563	CR	56 K 1/8 W, J
C 1	QFM42AJ-683	MY Cap	0.068 100 V
C 2	QCF32HP-103	C Cap	0.01 500 V
C 3	" -103	"	0.01 "
C 4	" -103	"	0.01 "
C 5	" -103	"	0.01 "
C 6	" -103	"	0.01 "
C 7	QET71VR-478	E Cap	4700 35 V
C 8	QET41ER-107	"	100 25 V
C 9	QET41AR-476	"	47 10 V
C10	QFM31HK-103	MY Cap	0.01 50 V
C11	QET41AR-336	E Cap	33 10 V
C12	QET41CR-227	"	220 16 V
C13	QFM31HK-104	MY Cap	0.1 50 V
C14	QET42AR-476	E Cap	47 100 V
C15	–	–	
C16	–	–	
C17	–	–	
C18	–	–	
C19	–	–	
C20	–	–	
C21	QET41CR-106	E Cap	10 16 V
C22	" -106	"	10 "
C23	–	–	
C24	–	–	
C25	–	–	
C26	–	–	
C27	QET41HR-106	E Cap	10 50 V
C28	QFM41HJ-104	MY Cap	0.1 "
⚠ F 1	QMF51U1-4R0	Fuse	4.0 A
⚠ F 2	" -R25	"	250 mA
⚠ F 3	" -R40	"	400 mA
⚠ F 4	" -1R25	"	1.25 A
⚠ F 5	" -R50	"	500 mA
⚠ F 6	" -R50	"	500 mA
	A44594	Fuse Holder	for F1 to F6
P 1	A75802-4	Cap Housing	11–14
P 2	–	–	
P 3	PU43351-104	Cap Housing	31–34
P 4	" -106	"	41–46
P 5	" -5	"	51–55
P 6	A75802-6	"	61–66
P 7	PU43351-3	"	71–73
P 8	" -102	"	81–82
P 9	" -103	"	91–93
P10	" -102	"	101–102
P11	" -102	"	111–112
P12	" -104	"	121–124
P13	" -2	"	131–132
P14	" -103	"	141–143
P15	" -103	"	151–153
P16	A75802-4	"	161–164

Symbol No.	Part No.	Part Name	Description
TP 1	A74138-1	Test Pin	
TP 2	" -1	"	
TP 3	" -1	"	
	PU43092	Collar	for R30–R32
	PU48862	Diode Stack Circuit Board	See 3 9
	QXT3100-010	Vinyl Tube	for C28
	QXT41HJ-010	"	"

9.2 MECHANISM CONTROL CIRCUIT BOARD ASS'Y
0 2 PU47799D

Symbol No.	Part No.	Part Name	Description
IC 1	MSM5830	Integrated Circuit	
X 1	2SD637R	Transistor	
X 2	"	"	
X 3	2SD639S	"	
X 4	–	–	
X 5	2SD637R	Transistor	
X 6	"	"	
X 7	2SD639S	"	
X 8	"	"	
X 9	2SC1162WTC	"	
X10	2SD637R	"	
D 1	MA150	Diode	
D 2	"	"	
D 3	"	"	
D 4	OA91	"	
D 5	V03C	"	
D 6	MA150	"	
D 7	V03C	"	
D 8	"	"	
D 9	MA150	"	
D10	"	"	
D11	"	"	
R 1	QRD187J-122	CR	1.2 K 1/8 W,J
R 2	" -122	"	1.2 K " "
R 3	–	–	
R 4	QRD187J-182	CR	1.8 K 1/8 W,J
R 5	" -104	"	100 K " "
R 6	" -104	"	100 K " "
R 7	" -275	"	2.7 M " "
R 8	" -152	"	1.5 K " "
R 9	" -122	"	1.2 K " "
R10	" -332	"	3.3 K " "
R11	" -223	"	22 K " "
R12	" -223	"	22 K " "
R13	" -223	"	22 K " "
R14	" -332	"	3.3 K " "
R15	" -223	"	22 K " "
R16	" -822	"	8.2 K " "
R17	" -822	"	8.2 K " "
R18	" -562	"	5.6 K " "

9.3 SERVO CIRCUIT BOARD ASS'Y

03 PU47989D

Symbol No.	Part No.	Part Name	Description
R19	QRD187J-224	CR	220 K 1/8 W,J
R20	" -223	"	22 K " "
R21	" -223	"	22 K " "
R22	" -152	"	1.5 K " "
R23	" -472	"	4.7 K " "
R24	" -102	"	1 K " "
R25	" -123	"	12 K " "
R26	" -473	"	47 K " "
R27	" -102	"	1 K " "
R28	" -104	"	100 K " "
⚠R29	QRG129J-331	OMR	330 1/2 W,J
R30	QRD187J-272	CR	2.7 K 1/8 W,J
R31	" -272	"	2.7 K " "
R32	" -224	"	220 K " "
R33	" -224	"	220 K " "
R34	" -122	"	1.2 K " "
R35	" -822	"	8.2 K " "
⚠R36	QRG019J-680	OMR	68 1 W, J
R37	QRD187J-221	CR	220 1/8 W,J
R38	" -102	"	1 K " "
R39	" -562	"	5.6 K " "
R40	QRD181J-331	"	330 " "
C 1	QET61HR-105M	E Cap	1 50 V
C 2	QFM31HJ-473	MY Cap	0.047 "
C 3	QET61HR-105M	E Cap	1 "
C 4	QET61CR-336M	"	33 16 V
C 5	QFM31HJ-153	MY Cap	0.015 50 V
C 6	QET61CR-227M	E Cap	220 16 V
C 7	QET61AR-476M	"	47 10 V
C 8	QFM31HJ-103	MY Cap	0.01 50 V
C 9	QET61CR-336M	E Cap	33 16 V
C10	" -476M	"	47 "
C11	QET61ER-475M	"	4.7 25 V
C12	QET61HR-335M	"	3.3 50 V
C13	QET21ER-228M	"	2200 25 V
P 1	A75802-6	Cap Housing	11–16
P 2	PU43351-107	"	21–27
P 5	" -102	"	51–52
P10	" -3	"	101–103
P14	" -3	"	141–143
P15	" -102	"	151–152
P16	" -102	"	161–162
P17	" -2	"	171–172
P18	" -3	"	181–183
TP1	A74138-1	Test Pin	
TP2	A45908-001	"	
TP3	" -001	"	
TP4	" -001	"	
	QLP3104-111	Lamp	Cassette Lamp
	PU47728	Lamp Holder	
	–	Start Sensor Circuit Board	See 19
	–	End Sensor Circuit Board	See 20

Symbol No.	Part No.	Part Name	Description
IC 1	UPC4558C	Integrated Circuit	or NJM4558D
IC 2	AN360	"	
IC 3	DN850	"	
IC 4	HA11711	"	
IC 5	DN850	"	
IC 6	8VT01	"	
IC 7	"	"	
IC 8	"	"	
IC 9	UPC1458C	"	
IC10	BA841	"	
IC11	BA614A	"	
IC12	"	"	
IC13	UPC1458C	"	
IC14	–	–	
IC15	–	–	
IC16	AN608P	Integrated Circuit	
X 1	2SD636R	Transistor	
X 2	"	"	
X 3	"	"	
X 4	"	"	
X 5	2SK40C	FET	
X 6	2SD636R	Transistor	
X 7	2SB512O	"	
X 8	2SD636R	"	
X 9	2SD958S	"	or 2SD958T
X10	2SD636R	"	
X11	"	"	
X12	"	"	
X13	2SC1983R	"	
X14	2SB643R	"	
X15	2SA564Q	"	
DA 1	DAP-401	Diode Array	
D 1	–	–	
D 2	1S2473VE	Diode	
D 3	"	"	
D 4	1S2473HJ	"	
D 5	"	"	
D 6	–	–	
D 7	–	–	
D 8	1S2473HJ	Diode	
D 9	"	"	
D10	"	"	
D11	–	–	
D12	1S2473HJ	Diode	
D13	"	"	
D14	"	"	
D15	"	"	
D16	"	"	
D17	"	"	
D18	"	"	
D19	"	"	
D20	"	"	
D21	"	"	
D22	RD24EB1	Zener Diode	
D23	1S2473HJ	Diode	
D24	"	"	
D25	"	"	
D26	"	"	
D27	"	"	

Symbol No.	Part No.	Part Name	Description
D28	1S2473HJ	Diode	
D29	1S2473VE	"	
D30	"	"	
D31	"	"	
D32	1S2473HJ	"	
D33	1S2473	"	
D34	RD6.8EB3	Zener Diode	
D35	RD13EB1	"	
R 1	–	–	
R 2	–	–	
R 3	–	–	
R 4	QRD187J-222A	CR	2.2 K 1/8 W, J
R 5	" -223A	"	22 K " "
R 6	" -121A	"	120 " "
R 7	" -683A	"	68 K " "
R 8	" -222A	"	2.2 K " "
R 9	–	–	
R10	–	–	
R11	QRD187J-472A	CR	4.7 K 1/8 W, J
R12	" -104A	"	100 K " "
R13	" -103A	"	10 K " "
R14	" -223A	"	22 K " "
R15	" -104A	"	100 K " "
R16	" -223A	"	22 K " "
R17	" -274A	"	270 K " "
R18	" -473A	"	47 K " "
R19	" -473A	"	47 K " "
R20	–	–	
R21	QRD187J-103A	CR	10 K 1/8 W, J
R22	" -104A	"	100 K " "
R23	QRD143K-683	"	68 K 1/4 W, K
R24	QRD187J-104A	"	100 K 1/8 W, J
R25	" -104A	"	100 K " "
R26	" -104A	"	100 K " "
R27	" -104A	"	100 K " "
R28	QVZ3501-473	VR	47 K
R29	QRD187J-153A	CR	15 K 1/8 W, J
R30	QVZ3501-104	VR	100 K
R31	QRD187J-154A	CR	150 K 1/8 W, J
R32	QVZ3501-473	VR	47 K
R33	QRD187J-153A	CR	15 K 1/8 W, J
R34	QVZ3501-104	VR	100 K
R35	QRD187J-154A	CR	150 K 1/8 W, J
R36	" -104A	"	100 K " "
R37	" -105A	"	1 M " "
R38	" -683A	"	68 K " "
R39	" -103A	"	10 K " "
R40	" -561A	"	560 " "
R41	" -103A	"	10 K " "
R42	QVP4A0B-472	VR	4.7 K
R43	QRD187J-103A	CR	10 K 1/8 W, J
R44	" -334A	"	330 K " "
R45	" -823A	"	82 K " "
R46	QVP4A0B-224	VR	220 K
R47	QRD187J-102A	CR	1 K 1/8 W, J
R48	QRD181J-473	"	47 K " "
R49	QVP4A0B-473	VR	47 K
R50	QRD187J-152A	CR	1 K 1/8 W, J
R51	" -272A	"	2.7 K " "
R52	" -104A	"	100 K " "
R53	" -223A	"	22 K " "

Symbol No.	Part No.	Part Name	Description
R54	QVP4A0B-474	VR	470 K
R55	QRD187J-334A	CR	330 K 1/8 W, J
R56	" -103A	"	10 K " "
R57	" -224A	"	220 K " "
R58	QVP4A0B-474	VR	470 K
R59	" -224	"	220 K
R60	QRD187J-104A	CR	100 K 1/8 W, J
R61	" -104A	"	100 K " "
R62	QVP4A0B-223	VR	22 K
R63	QRD187J-103A	CR	10 K 1/8 W, J
R64	–	–	
R65	QRD187J-104A	CR	100 K 1/8 W, J
R66	" -223A	"	22 K " "
R67	–	–	
R68	QRD187J-104A	CR	100 K 1/8 W, J
R69	" -103A	"	10 K " "
R70	" -682A	"	6.8 K " "
R71	QRD143K-225	"	2.2 M 1/4 W, K
R72	QRD187J-683A	"	68 K 1/8 W, J
R73	" -103A	"	10 K " "
R74	" -102A	"	1 K " "
R75	" -103A	"	10 K " "
R76	" -103A	"	10 K " "
R77	" -222A	"	2.2 K " "
R78	" -472A	"	4.7 K " "
R79	" -104A	"	100 K " "
R80	QVZ3501-224	VR	220 K
R81	QRD187J-154A	CR	150 K 1/8 W, J
R82	" -472A	"	4.7 K " "
R83	QVP4A0B-224	VR	220 K
R84	QRD187J-103A	CR	10 K 1/8 W, J
R85	PU44626T	Resistor	0.6
R86	QRD187J-472A	CR	4.7 K 1/8 W, J
R87	" -222A	"	2.2 K " "
R88	–	–	
R89	QRD187J-473A	CR	47 K 1/8 W, J
R90	–	–	
R91	QRD187J-224A	CR	220 K 1/8 W, J
R92	" -274A	"	270 K " "
R93	" -223A	"	22 K " "
R94	" -223A	"	22 K " "
R95	" -222A	"	2.2 K 1/8 W, J
R96	QRD143K-103	"	10 K 1/4 W, K
R97	QRD187J-103A	CR	10 K 1/8 W, J
R98	–	–	
R99	QRD187J-103A	CR	10 K 1/8 W, J
R100	" -104A	"	100 K " "
R101	" -561A	"	560 " "
R102	" -472A	"	4.7 K " "
R103	PU47809	VR	50 K
R104	QRD187J-472A	CR	4.7 K 1/8 W, J
R105	" -152A	"	1.5 K " "
R106	QVP4A0B-334	VR	330 K
R107	QRD187J-154A	CR	150 K 1/8 W, J
R108	" -472A	"	4.7 K " "
R109	" -472A	"	4.7 K " "
R110	" -104A	"	100 K " "
R111	" -334A	"	330 K " "
R112	" -102A	"	1 K " "
R113	" -223A	"	22 K " "
R114	" -562A	"	5.6 K " "
R115	" -103A	"	10 K " "
R116	" -223A	"	22 K " "

Symbol No.	Part No.	Part Name	Description
R117	QVP4A0B-472	VR	4.7 K
R118	QRD187J-103A	CR	10 K 1/8 W, J
R119	″ -152A	″	1.5 K ″ ″
R120	QVP4A0B-333	VR	33K
R121	QRD187J-682A	CR	6.8 K 1/8 W, J
R122	″ -223A	″	22 K ″ ″
R123	QVZ3501-224	VR	220 K
R124	QRD187J-683A	CR	68 K 1/8 W, J
R125	″ -104A	″	100 K ″ ″
R126	–	–	
R127	QRD187J-473A	CR	47 K 1/8 W, J
R128	″ -472A	″	4.7 K ″ ″
R129	QVP4A0B-472	VR	4.7 K
R130	QRD187J-103A	CR	10 K 1/8 W, J
R131	″ -224A	″	220 K ″ ″
R132	″ -472A	″	4.7 K ″ ″
R133	″ -223A	″	22 K ″ ″
R134	″ -223A	″	22 K ″ ″
R135	″ -223A	″	22 K ″ ″
R136	PU44626T	Resistor	0.6
R137	QRD187J-561A	CR	560 1/8 W, J
R138	–	–	
R139	QRD181J-473A	CR	47 K 1/8 W, J
R140	QRD187J-473A	″	47 K ″ ″
R141	″ -473A	″	47 K ″ ″
R142	QVP4A0B-104	VR	100 K
R143	″ -224	″	220 K
R144	QRD187J-474A	CR	470 K 1/8 W, J
R145	QRD143K-561	″	560 1/4 W, K
R146	QRD143K-472	″	4.7 K ″ ″
R147	QRD187J-103A	″	10 K 1/8 W, J
R148	QVP4A0B-224	VR	220 K
R149	ERT-D2FHK202S	Thermistor	
R150	QRD187J-153A	CR	15 K 1/8 W, J
R151	–	–	
R152	QRD187J-153A	CR	15 K 1/8 W, J
R153	″ -561A	″	560 ″ ″
R154	″ -105A	″	1 M ″ ″
R155	″ -103A	″	10 K ″ ″
R156	″ -105A	″	1 M ″ ″
R157	″ -222A	″	2.2 K ″ ″
R158	–	–	
R159	QRD187J-153A	CR	15 K 1/8 W, J
R160	″ -153A	″	15 K ″ ″
R161	″ -221A	″	220 ″ ″
R201	–	–	
R202	QRD187J-331A	CR	330 1/8 W, J
R203	QRD143K-103	″	10 K 1/4 W, K
R204	″ -222	″	2.2 K ″ ″
R205	″ -103	″	10 K ″ ″
R206	QRD187J-393A	″	39 K 1/8 W, J
R207	–	–	
R208	–	–	
R209	–	–	
R210	–	–	
R211	QRC141K-825	Comp. R	8.2 M 1/4 W, K
R212	QRD181J-472	CR	4.7 K 1/8 W, J
R213	″ -472	″	4.7 K ″ ″
R214	–	–	
R215	–	–	
R216	QRD143K-104	CR	100 K 1/4 W, K
R217	ERT-D2FHK202S	Thermistor	

Symbol No.	Part No.	Part Name	Description
R218	QRD181J-104	CR	100 K 1/8 W, J
R219	″ -473	″	47 K ″ ″
R220	″ -104	″	100 K ″ ″
R221	″ -104	″	100 K ″ ″
R222	″ -103	″	10 K ″ ″
R223	QRC141K-825	Comp. R	8.2 M 1/4 W, K
R224	QRD187J-104A	CR	100 K 1/8 W, J
C 1	–	–	
C 2	–	–	
C 3	–	–	
C 4	–	–	
C 5	QFM31HK-102	MY Cap	0.001 50 V
C 6	QET61CR-106	E Cap	10 16 V
C 7	QFM31HK-102	MY Cap	0.001 50 V
C 8	QET61CR-106	E Cap	10 16 V
C 9	–	–	
C10	QET61CR-476	E Cap	47 16 V
C11	QFM31HK-333	MY Cap	0.033 50 V
C12	″ -104	″	0.1 ″
C13	″ -104	″	0.1 ″
C14	″ -103	″	0.01 ″
C15	″ -104	″	0.1 ″
C16	QET61CR-476	E Cap	47 16 V
C17	QFM31HK-473	MY Cap	0.047 50 V
C18	″ -103	″	0.01 ″
C19	″ -104	″	0.1 ″
C20	QET61CR-106	E Cap	10 16 V
C21	QFM31HK-124	MY Cap	0.12 50 V
C22	″ -472	″	0.0047 ″
C23	QCS31HJ-331	C Cap	330 P ″
C24	QFM31HK-333	MY Cap	0.033 ″
C25	″ -473	″	0.047 ″
C26	QCS31HJ-390	C Cap	39 P ″
C27	″ -331	″	330 P ″
C28	QFM31HK-472	MY Cap	0.0047 ″
C29	″ -333	″	0.033 ″
C30	″ -563	″	0.056 ″
C31	QET61CR-476	E Cap	47 16 V
C32	QFM31HK-103	MY Cap	0.01 50 V
C33	″ -683	″	0.068 ″
C34	″ -683	″	0.068 ″
C35	QEE41CM-106B	T Cap	10 16 V
C36	QET61CR-106	E Cap	10 ″
C37	QFM31HK-102	MY Cap	0.001 50 V
C38	″ -224	″	0.22 ″
C39	″ -103	″	0.01 ″
C40	QET61CR-106	E Cap	10 16 V
C41	QFM31HK-104	MY Cap	0.1 50 V
C42	″ -104	″	0.1 ″
C43	″ -473	″	0.047 ″
C44	QET61CR-106	E Cap	10 16 V
C45	QEE41CM-335B	T Cap	3.3 ″
C46	″ -106B	″	10 ″
C47	QFM31HK-104	MY Cap	0.1 50 V
C48	″ -472	″	0.0047 ″
C49	QET61CR-106	E Cap	10 16 V
C50	″ -106	″	10 ″
C51	–	–	
C52	–	–	
C53	QFM31HK-103	MY Cap	0.01 50 V
C54	–	–	

Symbol No.	Part No.	Part Name	Description
R119	QRD181J-272	CR	2.7 K 1/8 W, J
R120	〃 -561	〃	560 〃
R121	〃 -183	〃	18 K 〃
R122	〃 -272	〃	2.7 K 〃
R123	〃 -681	〃	680 〃
R124	〃 -123	〃	12 K 〃
R125	〃 -472	〃	4.7 K 〃
R126	〃 -472	〃	4.7 K 〃
R127	QRD187J-272	〃	2.7 K 〃
R128	QRD181J-474	〃	470 K 〃
R129	〃 -561	〃	560 〃
R130	〃 -222	〃	2.2 K 〃
R131	QRD187J-332	〃	3.3 K 〃
R132	QRD181J-102	〃	1 K 〃
R133	〃 -564	〃	560 K 〃
R134	〃 -272	〃	2.7 K 〃
R135	QVP4A0B-103	VR	10 K
R136	QRD181J-332	CR	3.3 K 1/8 W, J
R137	〃 -104	〃	100 K 〃
R138	〃 -561	〃	560 〃
R139	〃 -822	〃	8.2 K 〃
R140	〃 -153	〃	15 K 〃
R141	〃 -562	〃	5.6 K 〃
R142	〃 -102	〃	1 K 〃
R143	〃 -472	〃	4.7 K 〃
R144	〃 -472	〃	4.7 K 〃
R145	QVP4A0B-103	VR	10 K
R146	QRD181J-392	CR	3.9 K 1/8 W, J
R147	〃 -821	〃	820 〃
R148	〃 -472	〃	4.7 K 〃
R149	〃 -183	〃	18 K 〃
R150	〃 -222	〃	2.2 K 〃
R151	〃 -103	〃	10 K 〃
R152	〃 -332	〃	3.3 K 〃
R153	〃 -102	〃	1 K 〃
R154	〃 -222	〃	2.2 K 〃
R155	〃 -102	〃	1 K 〃
R156	〃 -102	〃	1 K 〃
R157	QRD121J-471	〃	470 1/2 W, J
R158	QRD181J-472	〃	4.7 K 1/8 W, J
R159	–	–	
R160	QRD181J-181	CR	180 1/8 W, J
R161	〃 -223	〃	22 K 〃
R162	〃 -223	〃	22 K 〃
R163	〃 -471	〃	470 〃
R164	〃 -223	〃	22 K 〃
R165	〃 -561	〃	560 〃
R166	〃 -331	〃	330 〃
R167	〃 -183	〃	18 K 〃
R168	〃 -562	〃	5.6 K 〃
R169	〃 -223	〃	22 K 〃
R170	〃 -334	〃	330 K 〃
R171	〃 -223	〃	22 K 〃
R172	〃 -103	〃	10 K 〃
R173	〃 -153	〃	15 K 〃
R174	〃 -683	〃	68 K 〃
R175	〃 -103	〃	10 K 〃
R176	〃 -332	〃	3.3 K 〃
R177	〃 -271	〃	270 〃
R178	〃 -271	〃	270 〃
R179	〃 -223	〃	22 K 〃
R180	〃 -102	〃	1 K 〃

Symbol No.	Part No.	Part Name	Description
C 1	QCF31HP-223	C Cap	0.022 50 V
C 2	QET61CR-107	E Cap	100 16 V
C 3	QCF31HP-223	C Cap	0.022 50 V
C 4	QFM31HK-103	MY Cap	0.01 〃
C 5	QCS31HJ-151	C Cap	150 P 〃
C 6	QCF31HP-223	〃	0.022 〃
C 7	QET61AR-336	E Cap	33 10 V
C 8	QCF31HP-223	C Cap	0.022 50 V
C 9	QCS31HJ-820	〃	82 P 〃
C10	〃 -561	〃	560 P 〃
C11	〃 -101	〃	100 P 〃
C12	QFM31HK-104	MY Cap	0.1 〃
C13	QCS31HJ-101	C Cap	100 P 〃
C14	QET61CR-107	E Cap	100 16 V
C15	QCF31HP-223	C Cap	0.022 50 V
C16	QFM31HK-332	MY Cap	0.0033 〃
C17	QET61CR-106	E Cap	10 16 V
C18	QFM31HK-104	MY Cap	0.1 50 V
C19	QET61CR-336	E Cap	33 16 V
C20	QET60JR-476	〃	47 6.3 V
C21	QCS31HJ-121	C Cap	120 P 50 V
C22	QET61AR-476	E Cap	47 10 V
C23	QCS31HJ-270	C Cap	27 P 50 V
C24	〃 -121	〃	120 P 〃
C25	QFM31HK-103	MY Cap	0.01 〃
C26	QET61CR-336	E Cap	33 16 V
C27	〃 -476	〃	47 〃
C28	QCF31HP-223	C Cap	0.022 50 V
C29	QET61CR-336	E Cap	33 16 V
C30	QCS31HJ-330	C Cap	33 P 50 V
C31	QET61CR-476	E Cap	47 16 V
C32	QCS31HJ-331	C Cap	330 P 50 V
C33	〃 -181	〃	180 P 〃
C34	〃 -301	〃	300 P 〃
C35	QET61CR-476	E Cap	47 16 V
C36	QCF31HP-223	C Cap	0.022 50 V
C37	QCS31HJ-270	〃	27 P 〃
C38	QET61AR-336	E Cap	33 10 V
C39	QEN61CM-336	NP Cap	33 16 V
C40	QCS31HJ-221	C Cap	220 P 50 V
C41	〃 -101	〃	100 P 〃
C42	QET61CR-107	E Cap	100 16 V
C43	QCF31HP-223	C Cap	0.022 50 V
C44	QCS31HJ-270	〃	27 P 〃
C45	QET61CR-106	E Cap	10 16 V
C46	QCF31HP-223	C Cap	0.022 50 V
C47	QCS31HJ-181	〃	180 P 〃
C48	〃 -180	〃	18 P 〃
C49	〃 -121	〃	120 P 〃
C50	〃 -180	〃	18 P 〃
C51	QET61CR-227	E Cap	220 16 V
C52	QCF31HP-473	C Cap	0.047 50 V
C53	QFM31HK-102	MY Cap	0.001 〃
C54	QET61ER-475	E Cap	4.7 25 V
C55	QFM31HK-103	MY Cap	0.01 50 V
C56	QCS31HJ-301	C Cap	300 P 〃
C57	–	–	
C58	–	–	
C59	QET61CR-106	E Cap	10 16 V
C60	〃 -107	〃	100 〃
C61	QCF31HP-223	C Cap	0.022 50 V
C62	QET61AR-336	E Cap	33 10 V
C63	〃 -477	〃	470 〃

Symbol No.	Part No.	Part Name	Description
C64	QCS31HJ-561	C Cap	560 P 50 V
C65	QCF31HP-223	"	0.022 "
C66	QET60JR-476	E Cap	47 6.3 V
C67	QET61CR-476	"	47 16 V
C68	QCS31HJ-221	C Cap	220 P 50 V
C69	QET60JR-107	E Cap	100 6.3 V
C70	" -107	"	100 "
C71	QFM31HK-333	MY Cap	0.033 50 V
C72	" -102	"	0.001 "
C73	QET61HR-105	E Cap	1 "
C74	QFM31HK-333	MY Cap	0.033 "
C75	QET61CR-476	E Cap	47 16 V
C76	QCF31HP-223	C Cap	0.022 50 V
C77	QFM31HK-333	MY Cap	0.033 "
C78	" -333	"	0.033 "
C79	" -333	"	0.033 "
C80	" -102	"	0.001 "
C81	QCS31HJ-151	C Cap	150 P "
C82	QFM31HK-152	MY Cap	0.0015 "
C83	" -102	"	0.001 "
C84	QET61ER-335	E Cap	3.3 25 V
C85	QFM31HK-152	MY Cap	0.0015 50 V
C86	QEE51VM-224	T Cap	0.22 35 V
C87	QCS31HJ-471	C Cap	470 P 50 V
C88	QFM31HK-102	MY Cap	0.001 "
C89	QCS31HJ-330	C Cap	33 P "
C90	QFM31HK-102	MY Cap	0.001 "
C91	QCS31HJ-820	C Cap	82 P "
C92	QFM31HK-102	MY Cap	0.001 "
C93	" -102	"	0.001 "
C94	" -102	"	0.001 "
C95	" -102	"	0.001 "
C96	QCS31HJ-221	C Cap	220 P "
C97	" -561	"	560 P "
C98	QCT25CH-820	"	82 P
C99	QFM31HK-224	MY Cap	0.22 50 V
C100	" -472	"	0.0047 "
C101	" -102	"	0.001 "
C102	" -223	"	0.022 "
C103	QET61HR-105	E Cap	1 "
C104	QCT25CH--330	C Cap	33 P "
C105	" -560	"	56 P "
C106	QET61CR-476	E Cap	47 16 V
C107	QCF31HP-223	C Cap	0.022 50 V
C108	QET61CR-476	E Cap	47 16 V
C109	QCS31HJ-101	C Cap	100 P 50 V
C110	QCF31HP-223	"	0.022 "
C111	QFM31HK-102	MY Cap	0.001 "
C112	" -102	"	0.001 "
C113	QCS31HJ-391	C Cap	390 P "
C114	QFM31HK-333	MY Cap	0.033 "
C115	QET61HR-105	E Cap	1 "
C116	QFM31HK-683	MY Cap	0.068 "
C117	" -103	"	0.01 "
C118	QCS31HJ-820	C Cap	82 P "
C119	QET61HR-105	E Cap	1 "
C120	QFM31HK-183	MY Cap	0.018 "
C121	" -102	"	0.001 "
C122	QAT3001-015	TR Cap	20 P
C123	QCS31HJ-8R0	C Cap	8 P 50 V
C124	QET61CR-336	E Cap	33 16 V
C125	–	–	
C126	QCF31HP-223	C Cap	0.022 50 V
C127	QET60JR-336	E Cap	33 6.3 V

Symbol No.	Part No.	Part Name	Description
C128	QCF31HP-223	C Cap	0.022 50 V
C129	QET60JR-336	E Cap	33 6.3 V
C130	QCF31HP-473	C Cap	0.047 50 V
C131	QET60JR-336	E Cap	33 6.3 V
C132	QCF31HP-223	C Cap	0.022 50 V
C133	" -223	"	0.022 "
C134	–	–	
C135	QCF31HP-223	C Cap	0.022 50 V
C136	QCS11HJ-560	"	56 P "
C137	" -680	"	68 P "
C138	QCF11HP-223	"	0.022 "
C139	QCS11HJ-560	"	56 P "
C140	QFM31HK-103	MY Cap	0.01 "
C141	QCS11HJ-100	C Cap	10 P "
C142	" -101	"	100 P "
L 1	PU46021-101	Choke Coil	100 μH
L 2	" -101	"	100 μH
L 3	PU30284-22	"	3.3 mH
L 4	PU46021-101	"	100 μH
L 5	PU30284-19	"	2.2 mH
L 6	A04725-150	Peaking Coil	150 μH
L 7	" -56	"	56 μH
L 8	PU46021-101	Choke Coil	100 μH
L 9	A04725-68	Peaking Coil	68 μH
L10	PU46021-101	Choke Coil	100 μH
L11	A04725-47	Peaking Coil	47 μH
L12	" -18	"	18 μH
L13	" -68	"	68 μH
L14	PU46021-101	Choke Coil	100 μH
L15	" -101	"	100 μH
L16	" -101	"	100 μH
L17	" -101	"	100 μH
L18	" -101	"	100 μH
L19	" -101	"	100 μH
L20	PU30284-65	"	15 mH
L21	A04096-330	Peaking Coil	330 μH
L22	" -180	"	180 μH
L23	" -6.8	"	6.8 μH
	PU47555	Shield Case (1)	
	PU47556	" (2)	
	PU47557	" (3)	
	PU48274	Insulator	
	QXT3100-005	Vinyl Tube	
	A74138-1	Test Pin	
P 1	PU43351-6	Cap Housing	(11–16)
P 2	" -6	"	(21–26)
P 3	" -4	"	(31–34)
P 4	" -4	"	(41–44)
P 5	" -5	"	(51–55)
P 6	" -6	"	(61–66)
P 7	" -8	"	(71–78)

9.5 PRE/REC. CIRCUIT BOARD ASS'Y

$\boxed{0}\boxed{5}$ PU47932A-M

Symbol No.	Part No.	Part Name	Description
IC 1	EHM-822A29	Integrated Circuit	Hybrid
IC 2	HA11702	"	
X 1	2SC2647C	Transistor	
X 2	"	"	
X 3	"	"	
X 4	"	"	
X 5	"	"	
X 6	"	"	
X 7	2SD638R	"	
X 8	"	"	
X 9	"	"	
X10	"	"	
X11	2SC828Q	"	
X12	"	"	
X13	2SD638R	"	
X14	"	"	
X15	2SC828Q	"	
X16	"	"	
X17	2SC2647C	"	
X18	"	"	
X19	"	"	
X20	"	"	
X21	"	"	
D 1	OA91	Diode	
D 2	MA150	"	
D 3	"	"	
R 1	QRD181J-103	CR	10 K 1/8 W, J
R 2	QVP4A0B-102	VR	1 K
R 3	QRD181J-152	CR	1.5 K 1/8 W, J
R 4	" -221	"	220 "
R 5	QVP4A0B-152	VR	1.5 K
R 6	QRD181J-224	CR	220 K 1/8 W, J
R 7	QVP4A0B-222	VR	2.2 K
R 8	QRD181J-682	CR	6.8 K 1/8 W, J
R 9	QVP4A0B-222	VR	2.2 K
R10	QRD181J-331	CR	330 1/8 W, J
R11	" -562	"	5.6 K "
R12	" -153	"	15 K "
R13	" -153	"	15 K "
R14	" -822	"	8.2 K "
R15	" -562	"	5.6 K "
R16	" -182	"	1.8 K "
R17	" -222	"	2.2 K "
R18	" -122	"	1.2 K "
R19	" -391	"	390 "
R20	" -681	"	680 "
R21	" -221	"	220 "
R22	" -102	"	1 K "
R23	QVZ3506-101	VR	100 6 φ
R24	QRD181J-100	CR	10 1/8 W, J
R25	QVZ3506-101	VR	100 6 φ
R26	QRD181J-102	CR	1 K 1/8 W, J
R27	" -272	"	2.7 K "
R28	" -102	"	1 K "
R29	" -272	"	2.7 K "
R30	" -470	"	47 "
R31	" -3R9	"	3.9 "
R32	QRD181J-3R9	CR	3.9 1/8 W, J
R33	" -102	"	1 K "
R34	" -272	"	2.7 K "
R35	" -272	"	2.7 K "
R36	" -182	"	1.8 K "
R37	" -272	"	2.7 K "
R38	" -272	"	2.7 K "
R39	" -331	"	330 "
R40	QVZ3506-103	VR	10 K 6 φ
R41	" -103	"	10 K 6 φ
R42	QRD181J-331	CR	330 1/8 W, J
R43	" -272	"	2.7 K "
R44	" -272	"	2.7 K "
R45	" -331	"	330 "
R46	QVZ3506-103	VR	10 K 6 φ
R47	" -103	"	10 K 6 φ
R48	QRD181J-331	CR	330 1/8 W, J
R49	" -272	"	2.7 K "
R50	" -682	"	6.8 K "
R51	QRD141K-221	"	220 1/4 W, K
R52	QRD181J-102	"	1 K 1/8 W, J
R53	" -561	"	560 "
R54	" -103	"	10 K "
R55	" -103	"	10 K "
R56	" -103	"	10 K "
R57	" -222	"	2.2 K "
R58	" -222	"	2.2 K "
R59	" -182	"	1.8 K "
R60	" -102	"	1 K "
R61	" -391	"	390 "
R62	" -102	"	1 K "
R63	" -222	"	2.2 K "
R64	" -222	"	2.2 K "
R65	QVP4A0B-102	VR	1 K
R66	" -472	"	4.7 K
R67	QRD181J-272	CR	2.7 K 1/8 W, J
R68	—	—	
R69	QRD181J-391	CR	390 1/8 W, J
R70	" -104	"	100 K "
R71	" -103	"	10 K "
R72	" -332	"	3.3 K "
R73	" -101	"	100 "
R74	" -102	"	1 K "
R75	" -102	"	1 K "
R76	" -221	"	220 "
R77	" -272	"	2.7 K "
R78	" -222	"	2.2 K "
R79	" -221	"	220 "
R80	" -221	"	220 "
C 1	QET60JR-227	E Cap	220 6.3 V
C 2	QCF31HP-223	C Cap	0.022 50 V
C 3	QFM31HK-223	MY Cap	0.022 "
C 4	QCF31HP-223	C Cap	0.022 "
C 5	QFM31HK-473	MY Cap	0.047 "
C 6	" -333	"	0.033 "
C 7	" -473	"	0.047 "
C 8	QCF31HP-223	C Cap	0.022 "
C 9	QET61CR-476	E Cap	47 16 V
C10	QCF31HP-223	C Cap	0.022 50 V
C11	QET61CR-476	E Cap	47 16 V
C12	QFM31HK-103	MY Cap	0.01 50 V

Symbol No.	Part No.	Part Name	Description
C13	QFM31HK-103	MY Cap	0.01 50 V
C14	″ -103	″	0.01 ″
C15	QCS31HJ-150	C Cap	15 P ″
C16	QFM31HK-103	MY Cap	0.01 ″
C17	QEE51CM-106	T Cap	10 16 V
C18	″ -106	″	10 ″
C19	QCF31HP-223	C Cap	0.022 50 V
C20	″ -223	″	0.022 ″
C21	″ -223	″	0.022 ″
C22	″ -223	″	0.022 ″
C23	QEE51CM-106	T Cap	10 16 V
C24	QCF31HP-223	C Cap	0.022 50 V
C25	″ -223	″	0.022 ″
C26	QAT3001-009	TR Cap	50 P
C27	″ -009	″	50 P
C28	QCS31HJ-330	C Cap	33 P 50 V
C29	″ -150	″	15 P ″
C30	QCF31HP-223	″	0.022 ″
C31	″ -223	″	0.022 ″
C32	QAT3001-009	TR Cap	50 P
C33	″ -009	″	50 P
C34	QCS31HJ-330	C Cap	33 P 50 V
C35	″ -560	″	56 P ″
C36	″ -330	″	33 P ″
C37	QFM31HK-223	MY Cap	0.022 ″
C38	″ -223	″	0.022 ″
C39	QCF31HP-223	C Cap	0.022 ″
C40	″ -223	″	0.022 ″
C41	″ -223	″	0.022 ″
C42	QCS31HJ-470	″	47 P ″
C43	QET61HR-474	E Cap	0.47 ″
C44	QFM31HK-102	MY Cap	0.001 ″
C45	QET61CR-106	E Cap	10 16 V
C46	QCF31HP-223	C Cap	0.022 50 V
C47	QFM31HK-223	MY Cap	0.022 ″
C48	″ -103	″	0.01 ″
C49	″ -562	″	0.0056 ″
C50	″ -223	″	0.022 ″
C51	QCF31HP-223	C Cap	0.022 ″
C52	QET61CR-336	E Cap	33 16 V
C53	QFM31HK-223	MY Cap	0.022 50 V
C54	QCF31HP-223	C Cap	0.022 ″
C55	QFM31HK-103	MY Cap	0.01 ″
C56	″ -103	″	0.01 ″
C57	QET61HR-105	E Cap	1 50 V
C58	QFM31HK-223	MY Cap	0.022 ″
C59	QCS31HJ-150	C Cap	15 P ″
C60	QFM31HK-333	MY Cap	0.033 ″
C61	″ -333	″	0.033 ″
C62	″ -333	″	0.033 ″
C63	QCS31HJ-560	C Cap	56 P ″
C64	QCF31HP-223	″	0.022 ″
C65	″ -223	″	0.022 ″
DL 1	PU43627B	Delay Line	
HPF 1	PU30191-6D	High Pass Filter	
LPF 1	PU30192-6D	Low Pass Filter	
L 1	A04725-100	Peaking Coil	100 μH
L 2	″ -100	″	100 μH
L 3	″ -27	″	27 μH
L 4	″ -100	″	100 μH

Symbol No.	Part No.	Part Name	Description
L 5	A04725-1000	Peaking Coil	1 mH
L 6	″ -15	″	15 μH
L 7	″ -820	″	820 μH
L 8	″ -8.2	″	8.2 μH
L 9	″ -8.2	″	8.2 μH
	PU47947	Shield Case (1)	
	PU47948	″ (2)	
	PU47949	″ (3)	
	A74138-1	Test Pin	
P 1	PU43351-4	Cap Housing	11–14
P 2	″ -6	″	21–26
P 3	″ -5	″	31–35
P 4	″ -3	″	41–43

9.6 AUDIO CIRCUIT BOARD ASS'Y

0 6 PU47990D

Symbol No.	Part No.	Part Name	Description
IC 1	AN262	Integrated Circuit	
IC 2	UPC4558C	"	
IC 3	8VT02	"	
IC 4	BA222	"	
IC 5	"	"	
IC 6	AN360	"	
X 1	2SD661R	Transistor	or 2SD661S
X 2	"	"	"
X 3	2SD636S	"	or 2SD636T
X 4	"	"	"
X 5	2SD636R	"	or 2SD636S
X 6	"	"	"
X 7	2SD639R	"	or 2SD639S
X 8	2SD636R	"	or 2SD636S
X 9	"	"	"
X10	"	"	"
X11	2SD661R	"	or 2SD661S
X12	2SD636R	"	or 2SD636S
X13	2SB644R	"	or 2SB644S
X14	2SD639R	"	or 2SD639S
X15	2SD661R	"	or 2SD661S
X16	"	"	"
X17	2SD636S	"	or 2SD636T
X18	2SD661T	"	or 2SD661U
X19	"	"	"
X20	2SB788T	"	or 2SB788U
X21	2SD958T	"	or 2SD958U
X22	"	"	"
X23	2SD636R	"	or 2SD636S
X24	2SD639R	"	or 2SD639S
X25	"	"	"
X26	"	"	"
X27	2SD636R	"	or 2SD636S
D 1	MA150	Diode	
D 2	"	"	
D 3	"	"	
D 4	"	"	
D 5	"	"	
D 6	VO3C	"	
D 7	MA150	"	
D 8	"	"	
D 9	MA150LF	"	
D10	RD3.9EC	Zener Diode	
D11	MA150	Diode	
D12	"	"	
D13	"	"	
D14	"	"	
D15	MA150LF	"	
D16	RD11EB1	Zener Diode	
R 1	QRD183J-103	CR	10 K 1/8 W, J
R 2	QRD187J-181	"	180 "
R 3	" -470	"	47 "
R 4	" -472	"	4.7 K "
R 5	" -273	"	27 K "
R 6	" -222	"	2.2 K "
R 7	" -103	"	10 K "
R 8	QVP4A0B-682	VR	6.8 K

Symbol No.	Part No.	Part Name	Description
R 9	QRD187J-152	CR	1.5 K 1/8 W, J
R10	" -101	"	100 "
R11	" -102	"	1 K "
R12	" -473	"	47 K "
R13	" -333	"	33 K "
R14	" -102	"	1 K "
R15	" -473	"	47 K "
R16	" -333	"	33 K "
R17	" -223	"	22 K "
R18	" -102	"	1 K "
R19	" -223	"	22 K "
R20	" -223	"	22 K "
R21	" -125	"	1.2 M "
R22	" -684	"	680 K "
R23	" -103	"	10 K "
R24	" -103	"	10 K "
R25	QRD183J-333	"	33 K "
R26	QVP4A0B-103	VR	10 K
R27	QRD187J-103	CR	10 K 1/8 W, J
R28	" -333	"	33 K "
R29	" -333	"	33 K "
R30	" -333	"	33 K "
R31	QRD183J-103	"	10 K "
R32	QRD187J-121	"	120 "
R33	" -470	"	47 "
R34	" -331	"	330 "
R35	" -331	"	330 "
R36	" -103	"	10 K "
R37	" -153	"	15 K "
R38	" -822	"	8.2 K "
R39	" -473	"	47 K "
R40	" -223	"	22 K "
R41	" -682	"	6.8 K "
R42	" -104	"	100 K "
R43	" -223	"	22 K "
R44	" -473	"	47 K "
R45	" -682	"	6.8 K "
R46	" -153	"	15 K "
R47	" -223	"	22 K "
R48	" -333	"	33 K "
R49	" -155	"	1.5 M "
R50	" -562	"	5.6 K "
R51	" -473	"	47 K "
R52	" -562	"	5.6 K "
R53	" -222	"	2.2 K "
R54	" -121	"	120 "
R55	" -823	"	82 K "
R56	" -103	"	10 K "
R57	" -333	"	33 K "
R58	" -103	"	10 K "
R59	" -472	"	4.7 K "
R60	" -104	"	100 K "
R61	" -152	"	1.5 K "
R62	" -224	"	220 K "
R63	" -103	"	10 K "
R64	" -152	"	1.5 K "
R65	" -821	"	820 "
⚠R66	QRZ0053-680U	FR	68 1/4 W
⚠R67	QRG019J-330	OMR	33 1 W, J
R68	QRD187J-473	CR	47 K 1/8 W, J
R69	QVP4A0B-223	VR	22 K
R70	QRD187J-122	CR	1.2 K 1/8 W, J
R71	" -683	"	68 K "

Symbol No.	Part No.	Part Name	Description
R72	QRD187J-222	CR	2.2 K 1/8 W, J
R73	" -563	"	56 K "
R74	" -102	"	1 K "
R75	QRD183J-683	"	68 K "
R76	QRD187J-563	"	56 K "
R77	" -473	"	47 K "
R78	" -223	"	22 K "
R79	QVP4A0B-223	VR	22 K
R80	QRD187J-122	CR	1.2 K 1/8 W, J
R81	" -333	"	33 K "
R82	" -153	"	15 K "
R83	" -224	"	220 K "
R84	" -473	"	47 K "
R85	" -124	"	120 K "
R86	" -822	"	8.2 K "
R87	" -122	"	1.2 K "
R88	" -121	"	120 "
R89	" -153	"	15 K "
R90	QRD183J-472	"	4.7 K "
R91	" -223	"	22 K "
R92	QRD187J-823	"	82 K "
R93	" -183	"	18 K "
⚠ R94	QRG129J-331	OMR	330 1/2 W, J
R95	QRD187J-332	CR	3.3 K 1/8 W, J
R96	" -103	"	10 K "
R97	" -472	"	4.7 K "
R98	" -222	"	2.2 K "
R99	" -681	"	680 "
R100	" -333	"	33 K "
R101	–	–	
R102	QRD183J-103	CR	10 K 1/8 W, J
R103	" -103	"	10 K "
R104	–	–	
R105	QRD187J-103	CR	10 K 1/8 W, J
R106	" -102	"	1 K "
R107	" -222	"	2.2 K "
R108	" -102	"	1 K "
⚠ R109	QRG129J-150	OMR	15 1/2 W, J
⚠ R110	" -150	"	15 "
R111	QVP4A0B-683	VR	68 K
R112	QRD187J-473	CR	47 K 1/8 W, J
R113	–	–	
R114	QRD187J-472	CR	4.7 K 1/8 W, J
R115	" -102	"	1 K "
R116	QRD183J-154	"	150 K "
R117	QRD187J-334	"	330 K "
R118	" -103	"	10 K "
R119	QRD141K-331	"	330 1/4 W, K
R120	QRD183J-103	"	10 K 1/8 W, J
R121	QRD187J-122	"	1.2 K "
R122	QRD183J-222	"	2.2 K "
R123	" -153	"	15 K "
R124	–	–	
⚠ R125	QRZ0047-560	FR	56 1/4 W, J
C 1	QCS31HJ-561	C Cap	560 P 50 V
C 2	QET61CR-106	E Cap	10 16 V
C 3	QET61HR-105	"	1 50 V
C 4	QET60JR-476	"	47 6.3 V
C 5	QET61CR-106	"	10 16 V
C 6	QET61HR-105	"	1 50 V
C 7	QFM31HK-102	MY Cap	0.001 "

Symbol No.	Part No.	Part Name	Description
C 8	QCS31HJ-391	C Cap	390 P 50 V
C 9	" -681	"	680 P "
C10	QET61HR-105	E Cap	1 "
C11	QET61CR-227	"	220 16 V
C12	QET61HR-105	"	1 50 V
C13	" -105	"	1 "
C14	" -105	"	1 "
C15	" -105	"	1 "
C16	" -105	"	1 "
C17	QET61CR-106	"	10 16 V
C18	QET61HR-474	"	0.47 50 V
C19	QET61ER-475	"	4.7 25 V
C20	QET60JR-476	"	47 6.3 V
C21	QFM31HK-124	MY Cap	0.12 50 V
C22	" -473	"	0.047 "
C23	" -223	"	0.022 "
C24	QET61CR-336	E Cap	33 16 V
C25	" -106	"	10 "
C26	QET60JR-107	"	100 6.3 V
C27	" -476	"	47 "
C28	QFM31HK-104	MY Cap	0.1 50 V
C29	QET61CR-106	E Cap	10 16 V
C30	QET61ER-475	"	4.7 25 V
C31	" -475	"	4.7 "
C32	" -475	"	4.7 "
C33	" -475	"	4.7 "
C34	QFM31HK-104	MY Cap	0.1 50 V
C35	QET61CR-106	E Cap	10 16 V
C36	QEN41HA-105	NP Cap	1 50 V
C37	QET61CR-106	E Cap	10 16 V
C38	QFM31HK-104	MY Cap	0.1 50 V
C39	QET61CR-476	E Cap	47 16 V
C40	" -106	"	10 "
C41	QET61HR-105	"	1 50 V
C42	QET61CR-476	"	47 16 V
C43	QET61HR-105	"	1 50 V
C44	QFM31HK-682	MY Cap	0.0068 "
C45	QET61CR-476	E Cap	47 16 V
C46	" -106	"	10 "
C47	" -106	"	10 "
C48	QFM31HK-223	MY Cap	0.022 50 V
C49	QCS31HP-102	C Cap	0.001 "
C50	QCS11HJ-471	"	470 P "
C51	QET61CR-107	E Cap	100 16 V
C52	QEE41CM-475	T Cap	4.7 "
C53	QCS31HJ-121	C Cap	120 P 50 V
C54	" -561	"	560 P "
C55	QET61CR-476	E Cap	47 16 V
C56	" -476	"	47 "
C57	" -107	"	100 "
C58	" -106	"	10 "
C59	QFM31HK-103	MY Cap	0.01 50 V
C60	" -103	"	0.01 "
C61	" -103	"	0.01 "
C62	QFP32XK-272	PP Cap	0.0027 600 V
C63	" -392	"	0.0039 "
C64	QCS31HJ-561	C Cap	560 P 50 V
C65	QET61CR-336	E Cap	33 16 V
C66	QFM31HK-153	MY Cap	0.015 50 V
C67	QCS31HJ-101	C Cap	100 P "
C68	QET61CR-106	E Cap	10 16 V
C69	" -336	"	33 "
C70	–	–	

Symbol No.	Part No.	Part Name	Description
C71	QEE40JM-476	T Cap	47 6.3 V
L 1	PU30771-5	Coil	8.2 mH
L 2	A04725-8200	Peaking Coil	8.2 mH
L 3	" -2700	"	2.7 mH
L 4	PU40010-102	"	1 mH
RY	PU46682	Relay	G2V2
T 1	PU30961	Osc. Transformer	
P 1	PU43351-5	Cap Housing	(11–15)
P 2	" -6	"	(21–26)
P 3	" -103	"	(31–33)
P 4	" -5	"	(41–45)
P 5	" -7	"	(51–57)
P 6	" -2	"	(61–62)
P 7	" -9	"	(71–79)
P 8	" -2	"	(81–82)
P 9	" -3	"	(91–93)
P10	" -2	"	(101–102)
P11	" -2	"	(111–112)
P12	" -6	"	(121–126)
P13	" -7	"	(131–137)
P14	" -3	"	(141–143)
P15	" -2	"	(151–152)
P16	–	–	
P17	PU43351-103	Cap Housing	(171–173)
P18	" -3	"	(181–183)
	A74138-1	Test Pin	
	PU43092	Collar	for R66, R125
	QXT3100-010	Vinyl Tube	for C71
	QLP3104-107B	Lamp	REC. Lamp

9.7 OPERATION CIRCUIT BOARD ASS'Y

0 7 PU47798C

Symbol No.	Part No.	Part Name	Description
	PU20836-1-2	Operation Circuit Board	
	ML-PU1221	Operation Wire	
S1–S5	QSM1S01-014	Microswitch	
R 1	QRD187J-182	CR	1.8 K 1/8 W, J
R 2	" -272	"	2.7 K "
R 3	" -222	"	2.2 K "
R 4	" -272	"	2.7 K "
R 5	" -271	"	270 "
R 6	" -271	"	270 "

9.8 TIMING PHASE CIRCUIT BOARD ASS'Y

0 8 PU47782A

Symbol No.	Part No.	Part Name	Description
IC 1	MSM4011	Integrated Circuit	or UPD4011
IC 2	"	"	or "
X 1	2SC2647C	Transistor	
X 2	2SB745S	"	
X 3	2SC2647C	"	
D 1	–	–	
D 2	MA150	Diode	
D 3	"	"	
D 4	"	"	
D 5	"	"	
D 6	"	"	
R 1	QRD187J-473	CR	47 K 1/8 W, J
R 2	" -223	"	22 K "
R 3	" -473	"	47 K "
R 4	" -153	"	15 K "
R 5	" -104	"	100 K "
R 6	" -104	"	100 K "
R 7	" -223	"	22 K "
R 8	" -223	"	22 K "
R 9	QVZ3505-684	VR	680 K
R10	" -684	"	680 K
R11	QRD187J-223	CR	22 K 1/8 W, J
R12	" -223	"	22 K "
R13	–	–	
R14	–	–	
R15	QRD187J-223	CR	22 K 1/8 W, J
R16	" -223	"	22 K "
R17	" -104	"	100 K "
R18	" -223	"	22 K "
R19	" -222	"	2.2 K "
C 1	QFM31HK-102	MY Cap	0.001 50 V
C 2	" -104	"	0.1 "
TP1	A74138-1	Test Pin	
P 1	PU43351-107	Cap Housing	(11–17)
P 2	" -106	"	(21–26)

9.9 TAPE GUARD CIRCUIT BOARD ASS'Y $\boxed{0}\boxed{9}$ PU47916A

Symbol No.	Part No.	Part Name	Description
	PU47915-1-1	Tape Guard Circuit Board	
X 1	PN202S	Photo Transistor	
LED 1	5082-4694	L.E.D.	
R 1	QRD181K-123	CR	12 K 1/8 W, K
R 2	" -473	"	47 K "
R 3	QRD121K-681	"	680 1/2 W, K
	PU44897-2	Shade	

9.10 FUNCTION CIRCUIT BOARD $\boxed{1}\boxed{0}$

Symbol No.	Part No.	Part Name	Description
	PU32220	Function Circuit Board	
SW1	QSL2318-002	Lever Switch	Function
SW2	QSL2218-115	"	Video/TV
	SSSP2604Z	Screw	
	QLP3104-116B	Lamp	Function and Video Indicator
	PU46633	Bushing	
R 1	QRD187J-103	CR	10 K 1/8 W, J
R 2	" -331	"	330 "
C 1	QEE41EM-105	T Cap	1 25 V
P 1	PU43351-104	Cap Housing	11–14
P 2	" -102	"	21–22
P 3	" -102	"	31–32

9.11 HEATER & R.T. SELECT CIRCUIT BOARD ASS'Y $\boxed{1}\boxed{2}$ PU47678A

Symbol No.	Part No.	Part Name	Description
	PU47677	Heater & R.T. Select Circuit Board	
X 1	2SD638R	Transistor	
D 1	VO3C	Diode	
R 1	QRD187J-103	CR	10 K 1/8 W, J
C 1	QCF31HP-223	C Cap	0.022 50 V
RY1	PU46682	Relay	
⚠	PU44624	Thermal Lead Switch	
	PU45908-2	Test Pin	

9.12 SPEED CONTROL CIRCUIT BOARD ASS'Y

1 3 PU47781A

Symbol No.	Part No.	Part Name	Description
IC 1	HA17555PS	Integrated Circuit	
IC 2	UPC4558C	"	or NJM4558D
IC 3	HA17555PS	"	
IC 4	MSM4011	"	or UPD4011
IC 5	MSM4069UBRU	"	or UPD4069
X 1	2SC2647C	Transistor	
X 2	2SB745S	"	
X 3	2SC2647C	"	
X 4	2SB745S	"	
X 5	2SC2647C	"	
X 6	2SB643R	"	
X 7	"	"	
D 1	MA150	Diode	
D 2	"	"	
D 3	"	"	
D 4	"	"	
D 5	"	"	
D 6	"	"	
D 7	"	"	
D 8	–	–	
D 9	MA150	Diode	
D10	"	"	
D11	"	"	
D12	–	–	
D13	–	–	
D14	MA150	Diode	
D15	"	"	
D16	–	–	
D17	MA150	Diode	
D18	"	"	
D19	"	"	
D20	"	"	
D21	–	–	
D22	–	–	
D23	MA150	Diode	
D24	"	"	
D25	"	"	
D26	"	"	
D27	"	"	
D28	"	"	
D29	–	–	
D30	MA150	Diode	
D31	"	"	
R 1	QRD187J-104	CR	100 K 1/8 W, J
R 2	" -104	"	100 K "
R 3	" -104	"	100 K "
R 4	" -333	"	33 K "
R 5	" -682	"	6.8 K "
R 6	" -103	"	10 K "
R 7	" -123	"	12 K "
R 8	" -392	"	3.9 K "
R 9	" -334	"	330 K "
R10	" -684	"	680 K "
R11	" -333	"	33 K "
R12	" -104	"	100 K "
R13	" -223	"	22 K "
R14	" -103	"	10 K "
R15	QRD187J-104	CR	100 K 1/8 W, J
R16	" -124	"	120 K "
R17	" -104	"	100 K "
R18	" -103	"	10 K "
R19	" -103	"	10 K "
R20	–	–	
R21	QRD187J-103	CR	10 K 1/8 W, J
R22	" -103	"	10 K "
R23	" -104	"	100 K "
R24	" -223	"	22 K "
R25	–	–	
R26	QRD187J-103	CR	10 K 1/8 W, J
R27	" -104	"	100 K "
R28	–	–	
R29	QRD187J-104	CR	100 K 1/8 W, J
R30	" -103	"	10 K "
R31	" -103	"	10 K "
R32	" -223	"	22 K "
R33	" -104	"	100 K "
R34	" -104	"	100 K "
R35	" -104	"	100 K "
R36	–	–	
R37	–	–	
R38	QRD187J-472	CR	4.7 K 1/8 W, J
R39	" -104	"	100 K "
R40	" -104	"	100 K "
R41	" -563	"	56 K "
R42	–	–	
R43	QRD187J-103	CR	10 K 1/8 W, J
R44	" -223	"	22 K "
R45	" -103	"	10 K "
R46	" -223	"	22 K "
R47	" -103	"	10 K "
R48	" -223	"	22 K "
⚠ R49	QRG129J-560	OMR	56 1/2 W, J
R50	QRD187J-222	CR	2.2 K 1/8 W, J
R51	" -102	"	1 K "
R52	" -104	"	100 K "
R53	" -103	"	10 K "
R54	" -104	"	100 K "
R55	" -103	"	10 K "
R56	" -104	"	100 K "
R57	QRD143J-821	"	820 1/4 W, J
C 1	QET41CR-336	E Cap	33 16 V
C 2	QFM31HK-103	MY Cap	0.01 50 V
C 3	QCF31HP-103	C Cap	0.01 "
C 4	QFM31HJ-823	MY Cap	0.082 "
C 5	QET41HR-225	E Cap	2.2 "
C 6	QFM31HJ-394	MY Cap	0.39 "
C 7	QFM31HK-103	"	0.01 "
C 8	" -103	"	0.01 "
C 9	QEE51EM-105	T Cap	1 25 V
C10	QCF31HP-103	C Cap	0.01 50 V
C11	QFM31HK-223	MY Cap	0.022 "
C12	" -223	"	0.022 "
C13	–	–	
C14	QET41CR-106	E Cap	10 16 V
C15	" -106	"	10 "
C16	QCF11HP-473	C Cap	0.047 50 V
C17	QFM41HK-223	MY Cap	0.022 "

Symbol No.	Part No.	Part Name	Description
P 1	PU43351-4	Cap Housing	(11–14)
P 2	" -6	"	(21–26)
P 3	" -3	"	(31–33)
P 4	" -8	"	(41–48)
L 1	PU46021-101	Choke Coil	100 μH

9.13 SLOW/STILL SWITCH CIRCUIT BOARD $\boxed{1}\boxed{4}$

Symbol No.	Part No.	Part Name	Description
	PU32219	Slow/Still Switch Circuit Board	
	PU47856	Push Switch	

9.14 JOINT CIRCUIT BOARD ASS'Y

$\boxed{1}\boxed{5}$ PU47801A

Symbol No.	Part No.	Part Name	Description
IC 1	9VT02	Integrated Circuit	
X 1	2SD637R	Transistor	
X 2	"	"	
X 3	"	"	
X 4	"	"	
X 5	"	"	
X 6	2SB745S	"	
D 1	V03C	Diode	
D 2	"	"	
D 3	MA150	"	
D 4	"	"	
D 5	"	"	
D 6	"	"	
D 7	"	"	
R 1	QRD187J-822	CR	8.2 K 1/8 W, J
R 2	" -103	"	10 K "
R 3	QRD121J-750	"	75 1/2 W, J
R 4	QRD187J-222	"	2.2 K 1/8 W, J
R 5	" -184	"	180 K "
R 6	" -103	"	10 K "
R 7	" -822	"	8.2 K "
R 8	" -182	"	1.8 K "
R 9	" -104	"	100 K "
R10	" -473	"	47 K "
R11	" -104	"	100 K "
R12	" -472	"	4.7 K "
R13	" -182	"	1.8 K "
C 1	QET61CR-336	E Cap	33 16 V
C 2	QEN41CM-106	NP Cap	10 "
C 3	QET61CR-106	E Cap	10 "
RY-1	PU46682	Relay	(G2V2)
RY-2	"	"	(")
L 1	PU46021-101	Choke Coil	100 μH
	PU48086	Edge Saddle	
P 1	PU43351-5	Cap Housing	(11–15)
P 2	" -6	"	(21–26)
P 3	" -108	"	(31–38)
P 4	" -4	"	(41–44)
P 5	" -105	"	(51–55)
P 6	" -4	"	(61–64)
P 7	" -5	"	(71–75)
P 8	" -102	"	(81–82)
P 9	" -102	"	(91–92)

PRE SETTER AND CHANNEL SELECTOR CIRCUIT BOARD ASS'Y PU48060E

9.15 PRE SETTER CIRCUIT BOARD ASS'Y

1 6

Symbol No.	Part No.	Part Name	Description
D 1	MA162	Diode	
D 2	″	″	
D 3	″	″	
D 4	″	″	
D 5	″	″	
D 6	″	″	
D 7	″	″	
D 8	″	″	
D 9	″	″	
D10	″	″	
D11	″	″	
D12	″	″	
D13	″	″	
D14	″	″	
D15	″	″	
D16	″	″	
D17	″	″	
D18	″	″	
D19	″	″	
D20	″	″	
D21	″	″	
D22	″	″	
D23	″	″	
D24	″	″	
S 1	PU47960	Band Switch	
S 2	″	″	
S 3	″	″	
S 4	″	″	
S 5	″	″	
S 6	″	″	
S 7	″	″	
S 8	″	″	
S 9	″	″	
S10	″	″	
S11	″	″	
S12	″	″	
S13	QSM1S01-014	Micro Switch	AFT Switch
R 1	PU47961	Trimmer VR	20 K
R 2	″	″	″
R 3	″	″	″
R 4	″	″	″
R 5	″	″	″
R 6	″	″	″
R 7	″	″	″
R 8	″	″	″
R 9	″	″	″
R10	″	″	″
R11	″	″	″
R12	″	″	″
	PU48044	Pre Setter Cover	
	SBSB2006Z	Tapping Screw	
	PU47707	Cap Housing	11–17, 21–27

9.16 CHANNEL SELECTOR CIRCUIT BOARD ASS'Y

1 7

Symbol No.	Part No.	Part Name	Description
IC 1	UPC574J-KL	Integrated Circuit	
IC 2	UPC1363C	″	
X 1	2SD637R	Transistor	
X 2	″	″	
X 3	″	″	
X 4	″	″	
X 5	2SD389AO	″	
X 6	2SC2647C	″	
X 7	2SB644R	″	
X 8	2SD637R	″	
X 9	2SB643R	″	
X10	″	″	
X11	″	″	
X12	″	″	
X13	2SD637R	″	
X14	2SC2647C	″	
D 1	RD6.8EC	Zener Diode	
D 2	MA161	Diode	
D 3	″	″	
D 4	″	″	
D 5	–	–	
D 6	MA161	Diode	
R 1	–	–	
R 2	QRD187J-104	CR	100 K 1/8 W, J
R 3	″ -822	″	8.2 K ″
R 4	″ -334	″	330 K ″
R 5	″ -103	″	10 K ″
R 6	″ -222	″	2.2 K ″
R 7	″ -471	″	470 ″
R 8	″ -152	″	1.5 K ″
R 9	″ -102	″	1 K ″
R10	QVP4A0B-102	VR	1 K
R11	QRD187J-102	CR	1 K 1/8 W, J
R12	″ -223	″	22 K ″
R13	″ -562	″	5.6 K ″
R14	″ -223	″	22 K ″
R15	″ -103	″	10 K ″
R16	″ -103	″	10 K ″
R17	″ -393	″	39 K ″
R18	″ -563	″	56 K ″
R19	″ -103	″	10 K ″
R20	″ -183	″	18 K ″
R21	″ -182	″	1.8 K ″
R22	″ -103	″	10 K ″
R23	″ -103	″	10 K ″
R24	″ -154	″	150 K ″
R25	″ -124	″	120 K ″
R26	″ -153	″	15 K ″
R27	″ -104	″	100 K ″
R28	″ -124	″	120 K ″
R29	″ -104	″	100 K ″
R30	″ -152	″	1.5 K ″
R31	″ -223	″	22 K ″
R32	″ -103	″	10 K ″
R33	″ -273	″	27 K ″
R34	″ -103	″	10 K ″
R35	″ -102	″	1 K ″
R36	″ -683	″	68 K ″

Symbol No.	Part No.	Part Name	Description
R37	QRD187J-153	CR	15 K 1/8 W, J
R38	" -153	"	15 K "
⚠R39	QRG129J-560	OMR	56 1/2 W, J
R40	–	–	
R41	–	–	
R42	–	–	
R43	–	–	
R44	QRD187J-681	CR	680 1/8 W, J
R45	" -822	"	8.2 K "
C 1	QET41HR-106M	E Cap	10 50 V
C 2	" -474	"	0.47 "
C 3	QET41ER-476	"	47 25 V
C 4	QET41AR-476	"	47 10 V
C 5	QFM31HK-103	MY Cap	0.01 50 V
C 6	QET41CR-336	E Cap	33 16 V
C 7	QET41ER-107	"	100 25 V
C 8	QFM31HK-104	MY Cap	0.1 50 V
C 9	QET41CR-106	E Cap	10 16 V
C10	QFM31HK-103	MY Cap	0.01 50 V
C11	" -223	"	0.022 "
C12	" -223	"	0.022 "
C13	" -223	"	0.022 "
C14	QET41CR-476	E Cap	47 16 V
C15	–	–	
C16	–	–	
C17	–	–	
C18	–	–	
C19	QET41JR-476	E Cap	47 63 V
C20	QET41ER-227	"	220 25 V
P 1	PU43351-104	Cap Housing	(11–14)
P 2	" -103	"	(21–23)
P 3	" -102	"	(31–32)
P 4	" -106	"	(41–46)
P 5	" -108	"	(51–58)
P 6	" -103	"	(61–63)
P 7	" -106	"	(71–76)
	PU41624-6	Insulator	
	PU48036	Heat Sink	
	PU45375	Spacer	
	LPSP3010ZS	Screw	
	NNS3000ZS	Nut	

9.17 TUNER/IF CIRCUIT BOARD ASS'Y

1 8 PU47810B

Symbol No.	Part No.	Part Name	Description
IC 1	AN5111	Integrated Circuit	
IC 2	AN5220	"	
X 1	2SC458B	Transistor	
X 2	2SC460C	"	
X 3	"	"	
X 4	2SC1213AD	"	
D 1	RD9.1EB	Zener Diode	
D 2	MA150	Diode	
R 1	QRD187J-682	CR	6.8 K 1/8 W, J
R 2	" -222	"	2.2 K "
R 3	" -104	"	100 K "
R 4	" -183	"	18 K "
R 5	" -182	"	1.8 K "
R 6	" -152	"	1.5 K "
R 7	QVP4A0B-472	VR	4.7 K
R 8	QRD187J-391	CR	390 1/8 W, J
R 9	" -331	"	330 "
R10	" -103	"	10 K "
R11	" -332	"	3.3 K "
R12	" -221	"	220 "
R13	" -391	"	390 "
R14	" -472	"	4.7 K "
R15	" -273	"	27 K "
R16	" -274	"	270 K "
R17	" -102	"	1 K "
R18	" -102	"	1 K "
R19	" -473	"	47 K "
R20	" -103	"	10 K "
R21	QVP4A0B-222	VR	2.2 K
R22	QRD187J-332	CR	3.3 K 1/8 W, J
R23	" -561	"	560 "
R24	" -273	"	27 K "
R25	" -152	"	1.5 K "
R26	QVP4A0B-332	VR	3.3 K
R27	QRD187J-473	CR	47 K 1/8 W, J
R28	" -153	"	15 K "
R29	" -272	"	2.7 K "
R30	QRD127J-151	"	150 1/2 W, J
R31	QRD187J-750	"	75 1/8 W, J
⚠R32	QRG129J-220	OMR	22 1/2 W, J
R33	QRD187J-273	CR	27 K 1/8 W, J
R34	" -103	"	10 K "
R35	QVP4A0B-332	VR	3.3 K
⚠R36	QRG129J-560	OMR	56 1/2 W, J
R37	QRD187J-562	CR	5.6 K 1/8 W, J
R38	" -182	"	1.8 K "
R39	QRD181J-561	"	560 "
R40	" -561	"	560 "
C 1	QCF31HP-222	C Cap	2200 P 50 V
C 2	" -103	"	0.01 "
C 3	QET61HR-225	E Cap	2.2 "
C 4	QEW61HA-474	"	0.47 "
C 5	QCT25CH-1R0	C Cap	1 P
C 6	" -1R0	"	1 P
C 7	QCT25HH-430	"	43 P
C 8	QCS31HJ-220	"	22 P 50 V
C 9	QCF31HP-103	"	0.01 "

Symbol No.	Part No.	Part Name	Description
C10	QCT25PH-560	C Cap	56 P
C11	QCT25CH-120	"	12 P
C12	QCT25RH-151	"	150 P
C13	QCF31HP-103	"	0.01 50 V
C14	QEW61CA-106	E Cap	10 16 V
C15	QCS31HJ-820	C Cap	82 P 50 V
C16	QFM31HK-473	MY Cap	0.047 "
C17	QEE41VM-334	T Cap	0.33 35 V
C18	QEE41CM-685	"	6.8 16 V
C19	QEW61EA-335	E Cap	3.3 25 V
C20	QCF31HP-103	C Cap	0.01 50 V
C21	QEW61CA-106	E Cap	10 16 V
C22	QCF31HP-103	C Cap	0.01 50 V
C23	QET61AR-476	E Cap	47 10 V
C24	" -476	"	47 "
C25	QCS31HJ-151	C Cap	150 P 50 V
C26	QEW61AA-106	E Cap	10 10 V
C27	QCT25CH-330	C Cap	33 P
C28	QET61AR-476	E Cap	47 10 V
C29	" -477	"	470 "
C30	QET61CR-227	"	220 16 V
C31	QCF31HP-103	C Cap	0.01 50 V
C32	QCS31HJ-680	"	68 P "
C33	QCF31HP-222	"	2200 P "
C34	QFM31HK-683	MY Cap	0.068 "
C35	QCT25CH-180	C Cap	18 P
C36	QFM31HK-153	MY Cap	0.015 50 V
C37	QEW61CA-106	E Cap	10 16 V
C38	" -106	"	10 "
C39	QCF31HP-103	C Cap	0.01 50 V
C40	QEW61EA-335	E Cap	3.3 25 V
C41	QEW61HA-474	"	0.47 50 V
C42	QEW61EA-106	"	10 25 V
C43	–	–	
C44	QEE41EM-106	T Cap	10 25 V
C45	QCF31HP-103	C Cap	0.01 50 V
C46	QEW61EA-335	E Cap	3.3 25 V
C47	QCF31HP-103	C Cap	0.01 50 V
C48	" -102	"	0.001 "
C49	QFM41HK-102	MY Cap	0.001 "
L 1	A04725-82	Peaking Coil	82 μH
L 2	" -100	"	100 μH
L 3	" -1.8	"	1.8 μH
L 4	" -39	"	39 μH
HLB 1	PU47711-2	H.L.B.	
CF 1	PU47712	Ceramic Filter	
T 1	PU32176-2	Coil	41.25 MHz Trap
T 2	PU32167-3	"	AFC
T 3	PU32177-2	"	V. DET.
T 4	PU32178	"	4.5 MHz Trap
T 5	–	–	
T 6	PU32179	Coil	SIF Input
T 7	PU32180	"	S. DET.
	PU47881	Tuner Bracket	
	GPST3006ZS	Tap Screw	
	LPSP3004ZS	Screw	

Symbol No.	Part No.	Part Name	Description
TP1–11	PU45908-3	Test Point	
P 3	PU43351-3	Cap Housing	
P 4	" -5	"	
P 5	" -6	"	
⚠	PU32175-2	Tuner	US
	PU20816	Shield Case	
	PU20817	Shield Cover	
	PU20818	"	

9.18 START SENSOR CIRCUIT BOARD

1 9

Symbol No.	Part No.	Part Name	Description
	PU46394	Supply Photo Transistor Circuit Board	
X 1	PN202S	Photo Transistor	
	PU46395	Shade	
	PU46396	Circuit Board Bracket	
	LPSP3006ZS	Screw	

9.19 END SENSOR CIRCUIT BOARD

2 0

Symbol No.	Part No.	Part Name	Description
	PU44679	T.U. Photo Transistor Circuit Board	
X 1	PN202S	Photo Transistor	
	PU44897	Shade	
	PU44895	Circuit Board Bracket	
	DPSP3006ZS	Screw	

9.20 TIMER CIRCUIT BOARD ASS'Y

$\boxed{2}\boxed{1}$ PU47690A

Symbol No.	Part No.	Part Name	Description
IC 1	UPD650C-024	Integrated Circuit	
IC 2	MC14584B	"	
IC 3	SM5502A	"	
IC 4	MSM4514	"	or MC14514B
	PU47903	IC Socket	for IC 1
X 1	2SD639R	Transistor	
X 2	2SC1398Q	"	
X 3	2SD638R	"	
X 4	2SD389O	"	
X 5	2SD638R	"	
X 6	"	"	
X 7	2SC2647C	"	
X 8	2SB745S	"	
X 9	"	"	
X10	"	"	
TA1	UPA2003C	Transistor Array	
TA2	"	"	
TA3	TA54	"	
TA4	"	"	
D 1	MA162	Diode	
D 2	V03C	"	
D 3	MA162	"	
D 4	V03C	"	
D 5	RD16EB1	Zener Diode	
D 6	"	"	
D 7	MA162	Diode	
D 8	RD13EB	Zener Diode	
D 9	MA162	Diode	
D10	"	"	
D11	"	"	
D12	"	"	
D13	"	"	
D14	"	"	
D15	–	–	
D16	–	–	
D17	MA162	Diode	
D18	"	"	
D19	"	"	
D20	"	"	
D21	"	"	
D22	"	"	
D23	"	"	
D24	"	"	
D25	"	"	
D26	"	"	
D27	"	"	
D28	"	"	
D29	"	"	
D30	"	"	
D31	"	"	
D32	"	"	
D33	"	"	
D34	"	"	
D35	"	"	
D36	"	"	

Symbol No.	Part No.	Part Name	Description
D37	MA162	Diode	
D38	"	"	
D39	"	"	
D40	"	"	
D41	"	"	
D42	"	"	
D43	"	"	
D44	"	"	
D45	"	"	
D46	"	"	
D47	"	"	
D48	"	"	
D49	"	"	
D50	"	"	
D51	"	"	
D52	"	"	
D53	"	"	
D54	"	"	
D55	"	"	
D56	"	"	
D57	"	"	
D58	"	"	
X'TAL	PU47695	Crystal	(4.194304 MHz)
RM1	EXB-RB7274N	Resistor Module	
RM2	"	"	
RA1	EXB-P88333M	Resistor Array	
RA2	EXB-P88334M	"	
RA3	EXB-P812333M	"	
⚠T 1	PU47694	Transformer	DC-DC Converter
T 2	PU47693	IFT	
R 1	QRD187J-183	CR	18 K 1/8 W, J
R 2	" -222	"	2.2 K "
R 3	" -333	"	33 K "
R 4	" -222	"	2.2 K "
R 5	" -271	"	270 "
R 6	" -392	"	3.9 K "
R 7	" -392	"	3.9 K "
R 8	QVZ3507-473	VR	47 K
R 9	–	–	
R10	QRD187J-333	CR	33 K 1/8 W, J
R11	" -154	"	150 K "
R12	" -102	"	1 K "
R13	" -333	"	33 K "
R14	" -822	"	8.2 K "
R15	" -102	"	1 K "
R16	" -154	"	150 K "
R17	" -334	"	330 K "
R18	" -103	"	10 K "
R19	" -333	"	33 K "
R20	" -271	"	270 "
R21	–	–	See $\boxed{2}\boxed{4}$ BACK-UP CIRCUIT
R22	–	–	
R23	–	–	
R24	–	–	

Symbol No.	Part No.	Part Name	Description
R25	QRD187J-271	CR	270 1/8 W, J
R26	QRD141K-332	"	3.3 K 1/4 W, K
R27	QRD187J-223	"	22 K 1/8 W, J
C 1	QCF31HP-222	C Cap	2200 P 50 V
C 2	QCS31HJ-101	"	100 P "
C 3	QET41HR-106	E Cap	10 "
C 4	QEC81AM-107	"	100 10 V
C 5	QET41HR-106	"	10 50 V
C 6	QET40JR-476	"	47 6.3 V
C 7	QEE41VM-104	T Cap	0.1 35 V
C 8	QET41CR-106	E Cap	10 16 V
C 9	QFM31HK-102	MY Cap	0.001 50 V
C10	QET41CR-336	E Cap	33 16 V
C11	QET41VR-336	"	33 35 V
C12	QCF31HP-222	C Cap	2200 P 50 V
C13	QET41ER-475	E Cap	4.7 25 V
C14	" -475	"	4.7 "
C15	QCT25CH-5R0	C Cap	5 P
C16	QFM41HK-102	MY Cap	0.001 50 V
C17	QAT3001-011	TR Cap	20 P
C18	QCT25CH-8R0	C Cap	8 P
C19	QET40JR-336	E Cap	33 6.3 V
C20	QET41HR-225	"	2.2 50 V
L 1	A04096-100	Peaking Coil	100 μH
P 1	PU43351-6	Cap Housing	
P 2	" -8	"	
P 3	PU47697	Connector	
P 4	PU43351-3	Cap Housing	
P 5	" -7	"	
P 6	" -105	"	
P 7	" -108	"	
P 8	" -108	"	
P 9	" -107	"	
P10	" -3	"	
	QLP3104-115B	Lamp	Channel setting indicator
TP-1	A74138-1	Test Pin	

9.21 DISPLAY CIRCUIT BOARD ASS'Y

2 2 **PU47691A-M**

Symbol No.	Part No.	Part Name	Description
IC 1	TC5064BP	Integrated Circuit	
IC 2	"	"	
IC 3	"	"	
RA1	EXB-P88334M	Resistor Array	
RA2	"	"	
RA3	EXB-P89104M	"	
RA4	"	"	
S 1	QSL2318-002	Lever Switch	
S 2	PU47034	Push Switch	
S 3	"	"	
S 4	"	"	
S 5	"	"	
FD1	PU32010	Fluorescent Display	
P 1	PU43351-5	Cap Housing	11–15
P 2	" -8	"	21–28
P 3	" -8	"	31–38
P 4	" -7	"	41–47

9.22 BACK-UP CIRCUIT BOARD ASS'Y

2 4 **PU47692A**

Symbol No.	Part No.	Part Name	Description
	PU47519	Back-up Circuit Board	
R21	QRD187J-103	CR	10 K 1/8 W, J
R22	" -103	"	10 K "
R23	" -103	"	10 K "
R24	" -103	"	10 K "
C21	PU47696	Gold Cap	10 F, 1.6 V, M
C22	"	"	10 F, 1.6 V, M
C23	"	"	10 F, 1.6 V, M
C24	"	"	10 F, 1.6 V, M

9.23 POWER TR. CIRCUIT BOARD (SERVO)

2 6

Symbol No.	Part No.	Part Name	Description
	PU48153	Power Transistor Circuit Board	
X 1	2SC1983R	Transistor	
	PU45375	Spacer	
	PU41624-6	Insulator	for Transistor
	LPSP3008ZS	Screw	

9.24 POWER TR. CIRCUIT BOARD (REG.)

27

Symbol No.	Part No.	Part Name	Description
	PU32246	Power Transistor Circuit Board	
X 1	2SC2484P	Transistor	
X 2	"	"	
	PU41624-12	Insulator	for Transistor
	PU45375-4	Spacer	
	LPSP3008ZS	Screw	

9.25 CONNECTOR CIRCUIT BOARD

28

Symbol No.	Part No.	Part Name	Description
	PU47921-1-3	Connector Circuit Board	
R 1	QRD187J-683	CR	68 K 1/8 W, J
P 1	PU43351-105	Cap Housing	
P 2	" -102	"	
P 3	" -103	"	

9.26 A.E. & A/CTL. HEAD CIRCUIT BOARD

30

Symbol No.	Part No.	Part Name	Description
	PU46436	Head Circuit Board	

9.27 FULL ERASE HEAD CIRCUIT BOARD

31

Symbol No.	Part No.	Part Name	Description
	PU47864	Full Erase Head Circuit Board	

9.28 CUE HEAD CIRCUIT BOARD 36

Symbol No.	Part No.	Part Name	Description
	PU32263-1-2	Cue Head Circuit Board	

9.29 VOICE CONTROL CIRCUIT BOARD ASS'Y

38 PU48077A

Symbol No.	Part No.	Part Name	Description
IC 1	MN3001	Integrated Circuit	
IC 2	UPD4066C	"	or MSM4066
IC 3	UPC741C	"	
IC 4	MSM4069UBRU	"	
IC 5	UPD4040C	"	or MSM4040
IC 6	UPD4066C	"	or MSM4066
X 1	2SD636R	Transistor	or 2SD636S
X 2	"	"	"
X 3	"	"	"
D 1	–	–	
D 2	–	–	
D 3	–	–	
D 4	RD9.1EB3	Zener Diode	
D 5	MA150	Diode	
R 1	QRD187J-104	CR	100 K 1/8 W, J
R 2	" -104	"	100 K "
R 3	" -122	"	1.2 K "
R 4	" -681	"	680 "
R 5	" -561	"	560 "
R 6	" -104	"	100 K "
R 7	QVP4A0B-103	VR	10 K
R 8	QRD187J-153	CR	15 K 1/8 W, J
R 9	" -152	"	1.5 K "
R10	QVP4A0B-103	VR	10 K
R11	" -103	"	10 K
R12	QRD187J-123	CR	12 K 1/8 W, J
R13	" -123	"	12 K "
R14	QVP4A0B-683	VR	68 K
R15	QRD187J-103	CR	10 K 1/8 W, J
R16	" -332	"	3.3 K "
R17	" -104	"	100 K "
R18	" -103	"	10 K "
R19	" -473	"	47 K "
R20	" -103	"	10 K "
R21	" -333	"	33 K "
R22	" -104	"	100 K "
R23	" -105	"	1 M "
R24	QVP4A0B-473	VR	47 K
R25	QRD121K-471	CR	470 1/2 W, K
R26	QRD187J-333	"	33 K 1/8 W, J
R27	" -333	"	33 K "
R28	" -473	"	47 K "
R29	" -103	"	10 K "
R30	" -223	"	22 K "
C 1	QFM31HK-222	MY Cap	0.0022 50 V
C 2	" -123	"	0.012 "
C 3	QET61CR-336	E Cap	33 16 V
C 4	QFM31HK-124	MY Cap	0.12 50 V
C 5	" -123	"	0.012 "
C 6	QET61ER-475	E Cap	4.7 25 V
C 7	" -475	"	4.7 "
C 8	QFM31HK-472	MY Cap	0.0047 50 V
C 9	QCS31HJ-561	C Cap	560 P "
C10	QET61CR-106	E Cap	10 16 V
C11	QET61ER-475	"	4.7 25 V
C12	QCS31HJ-151	C Cap	150 P 50 V
C13	QET61CR-336	E Cap	33 16 V
C14	" -336	"	33 "
C15	QFN41HJ-563	MY Cap	0.056 50 V

Symbol No.	Part No.	Part Name	Description
L 1	A04725-8200	Peaking Coil	8.2 mH
L 2	" -1000	"	1 mH
	A74138-1	Test Pin	TP1–5
P 1	PU43351-6	Cap Housing	(11–16)

9.30 DIODE STACK CIRCUIT BOARD

3 9

Symbol No.	Part No.	Part Name	Description
	PU48862	Diode Stack Circuit Board	
DS 1	M4B51-11	Diode Stack	
	GPST3016ZS	Tap Screw	

9.31 CAMERA POWER CIRCUIT BOARD ASS'Y

4 0 PU48242A

Symbol No.	Part No.	Part Name	Description
DS 1	S4VB-10	Diode Stack	
⚠R 1	QRG029J-151M	OMR	150 2 W, J
C 1	QCF32HP-103	C Cap	0.01 500 V
C 2	" -103	"	0.01 "
C 3	" -103	"	0.01 "
C 4	" -103	"	0.01 "
C 5	" -103	"	0.01 "
C 6	QEV71VR-688	E Cap	6800 35 V
⚠F 1	QMF51U1-3R15	Fuse	3.15 A
	A44594	Fuse Holder	for F1
	PU43351-3	Cap Housing	11–13
	A75802-3	"	21–23
	PU43351-3	"	41–43
	LPSP3014ZS	Screw	
	NNS3000ZS	Nut	
	PU47983-1-2	Heat Sink	

9.32 POWER TR. CIRCUIT BOARD

4 1

Symbol No.	Part No.	Part Name	Description
	PU48155	Power Transistor Circuit Board	
X 1	–	–	
X 2	2SC1983R	Transistor	for Servo
	PU45375	Spacer	for Transistor
	PU41624-6	Insulator	
	LPSP3008ZS	Screw	

9.33 LED CIRCUIT BOARD

4 2

Symbol No.	Part No.	Part Name	Description
	PU48494-1-2	LED Circuit Board	
LED 1	SLB-26GG	LED	EP mode indicator